West Nile Virus

Preparedness and Prevention Plan

for

Ontario

May 27, 2003

Ontario Ministry of Health and Long-Term Care

Preface

This following document is the most recent version, revised May 27, 2003, of the *West Nile Virus - Preparedness and Prevention Plan for Ontario – 2003,* a technical reference document for Ontario's 37 Health Units. The original document was issued with the same title in March 2003.

The May 27th edition of the province's *West Nile Virus - Preparedness and Prevention Plan for Ontario – 2003* addresses the enhanced mosquito control measures under O. Reg. 199/03 and incorporates discussions from the working group of Health Unit representatives on implementation relating to the new Regulation.

Under O. Reg. 199/03, the Medical Officer of Health is required to conduct a risk assessment of the local conditions pertaining to WNv in the Health Unit. This risk assessment will identify where the required mosquito control activities (i.e., larviciding or adulticiding) can most effectively be applied, and further, requires the local municipality to undertake the measures necessary for mosquito control. The municipality is required to carry out specific mosquito control measures when directed by the medical officer of health.

Under the Regulation, the Medical Officer of Health is required to record, investigate, and report any confirmed or likely adverse or unintended human health effects attributed to mosquito control actions, and report any non-human environmental adverse effects to the Ministry of the Environment and/or other relevant local or provincial authorities.

Acknowledgements

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- Ontario MOHLTC, Laboratories Branch;
- Ontario MOHLTC, Communications and Information Branch;
- Ontario Ministry of the Environment, Standards Development Branch, Pesticides Section;
- Ontario Ministry of Agriculture, Food and Rural Affairs, Veterinary Science (now called Ontario Ministry of Agriculture and Food);
- Ontario Ministry of Natural Resources, Forest Management Branch;
- The Canadian Cooperative Wildlife Health Centre;
- Health Canada, National Microbiology Laboratory;
- Health Canada, Centre for Infectious Disease Prevention and Control;
- The University of Guelph;
- Brock University

The Public Health Branch is also appreciative of the advice from the federal-provincial National Steering Committee for West Nile Virus.

In particular, the Ministry of Health and Long-Term Care would like to thank the Health Units of Ontario for their input into the 2003 *West Nile Virus Preparedness and Prevention Plan.*

Special thanks is given to the City of Chicago and the City of New York for the excellent model plan, and for placing it in the public domain.

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Executive Summary

Public Heath Preparedness and Prevention Plan – 2003 Overview

The Ontario West Nile virus (WNv) planning resource document for 2003 builds on the experience Ontario's public health system had with West Nile virus since 2000. This document incorporates new findings over the same period, and represents the field guide to the 7-Point Action Plan announced by the Ministry of Health and Long-Term Care (MOHLTC) on March 22, 2003. The 7-Point Action Plan includes expanded laboratory services, enhanced surveillance, an extensive public education campaign, a new early warning system, a study to determine extent of community exposure to WNv and ongoing research activity.

The planning resource document is designed to provide the planning basis for a provincial approach to the preventing and controlling of West Nile virus by provincial Health Units, which provide the first line of public health protection in Ontario.

The plan is premised upon the local Health Units undertaking a risk assessment pertinent to their jurisdiction to ensure that all relevant factors are taken into consideration around decisions involving appropriate actions as required by the *Health Protection and Promotion Act* and relevant regulations, as well as the report of the National Guidelines for the Prevention of West Nile virus 2002 (Draft – January 3, 2003).

Public Education, Risk Communication and Community Outreach

Public education on personal protective measures remains the primary focus of intervention by the MOHLTC, and the provinces Health Units will again be provided with materials produced by the Ministry's Communications and Information Branch.

Public education will focus on personal protection through the use of mosquito repellents, protective clothing, and reducing exposure to biting mosquitoes. The education materials will be updated to address new information that has emerged regarding the transmission of WNv in Ontario (blood products, organ transplants, maternal vertical transfer.) This education strategy will also include a proactive outreach program that takes the message about the importance of identifying and reducing mosquito-breeding sites directly to homeowners and residents in the community.

Host (Bird) Surveillance

The Canadian Cooperative Wildlife Health Centre (CCWHC) will focus on birds from those areas where WNv appeared in humans in 2002, and then expand the program across the province on a tiered basis. The sampling began approximately one month earlier (April 15) than in previous years, and will utilize a new technique called the VecTest™. The timeliness of WNv detection will be much improved with the VecTest™. Health Canada will continue to support the testing at the CCWHC.

Human Surveillance

WNv illness is now a reportable illness under Ontario Regulation 559/91, made under the *Health Protection and Promotion Act,* which became effective on May 1, 2003. WNv also has a new case definition and provisions to protect Canada's blood supply are in place (see page 12)

Mosquito Surveillance
Mosquito enumeration and species identification will be provided by Brock University through 2003 and will be available to all Health Units. In addition, the 2003 mosquito surveillance will include viral testing of mosquito pools.

As with the bird sampling, a tiered response will be used based upon the findings of WNv human cases from last year and the mosquito results of past years. Brock University will also be providing a field consultation service to all Health Units to review local mosquito surveillance programs as well as providing training for Health Unit staff who did not receive training previously. As before, the MOHLTC will provide the light traps to the Health Units.

Larval and Adult Mosquito Control
The Ministry has provided the Health Units with a table outlining the action response levels for larviciding and adulticiding. The action levels are contained in O. Reg. 199/03 (see Appendix 7). With respect to larviciding, the Ministry has undertaken to provide at no cost to the Health Units, all larviciding materials, and to share the costs of all larviciding application work.

The Ministry of the Environment (MOE) is the regulatory provincial agency for all pesticide applications, such as larviciding or adulticiding (see definitions page 21). Public Health Branch staff are available for consultation by Medical Officers of Health on aspects of their risk assessments at the Health Unit level for decision-making around mosquito control measures.

A local risk assessment is an essential prerequisite to a decision to implement mosquito control measures. It is expected that a decision to implement mosquito control measures will be guided by this Plan and the provisions of O. Reg. 199/03. Control measures (larviciding or adulticiding) must take into consideration the current, available data, populations at risk, the burden or impact of WNv mortality and morbidity in the human population, non-human surveillance findings, vector density, distribution and infection rates (if available), seasonal factors and local weather and geographic factors.

As indicated above, adult mosquito control, often referred to as "spraying" or "fogging", is focused on specific geographic areas identified through a risk assessment where the human population is considered most at risk from WNv. Adulticiding represents a component in the full spectrum of control measures and is a necessary inclusion in order to ensure a risk assessment grid is complete. Given the public concern over adulticiding, emphasis is placed on larviciding programs, with the expectation that reduction of mosquito populations at the larva stage in the life cycle will reduce the potential need for adulticiding programs later.

Surveillance of Potential Adverse Health Effects from Pesticide Exposure
By regulation under the *Health Protection and Promotion Act*, the Health Units are required to record, investigate and report any confirmed or potential adverse or unintended human health effects attributed to mosquito control actions, and will report any non-human environmental adverse effects to the Ministry of the Environment and other relevant local or provincial authorities.

Equine (Horse) Surveillance
Equine WNv cases will be reported to the MOHLTC by the Ministry of Agriculture and Food. Data are anticipated to be more complete for the WNv situation in horses because the Canadian Food Inspection Agency (CFIA) has made WNv in horses an immediately notifiable disease under its legislation.

Research and Evaluation
There are several studies underway in Ontario.

A human seroprevalence study is currently underway in Halton Region to determine the extent of community exposure to WNv. The objective of the study is to gather data on how many people were infected with WNv in 2002, but did not exhibit serious WNv illness. This study will provide a baseline for determining the percentage of Ontarians who become infected but do not manifest clinical symptoms of WNv illness.

An evaluation will be undertaken of the impact, if any, which the viral testing of mosquitoes may have had on the decisions made by the Medical Officers of Health in 2003 respecting whether to larvicide or to adulticide.

A study is being undertaken by Health Canada and the Canadian Cooperative Wildlife Health Centre to determine the efficacy of the recording of dead bird sightings for public health protection. The recording of such dead bird sightings will be regarded as a local option until the results of the study are known. The Ministry will review the data at that time.

INTRODUCTION

West Nile virus (WNv) can cause disease and mortality in many species of birds and mammals, including humans. Taxonomically, this arthropod-borne virus ("arbovirus") belongs to a family of flaviviruses (*Flaviviridae*). More specifically WNv belongs to the "Japanese encephalitis serocomplex" of viruses, which includes the St. Louis encephalitis virus (closely related to WNv), Japanese encephalitis virus, the Kunjin and Murray Valley encephalitis viruses, and other flaviviruses.

The arthropods, or vectors which carry and transmit WNV, are mosquitoes – mostly bird-feeding species such as *Culex* but also other genera and species of mosquito – and (in the "Old World") ticks: "soft ticks" (argasids) and "hard ticks" (ixodids). The West Nile virus propagates in nature primarily through a "bird-mosquito-bird" cycle of transmission, as well as through a "bird-tick-bird" transmission cycle, in which the ticks feed on birds that provide a reservoir of the disease.

The urban cycle of the disease requires species of mosquitoes that feed on synanthropic or domestic birds and people. These are known as "bridge vectors". While birds comprise the primary or "reservoir" hosts for the virus, mammals (including humans) function as "incidental" or "dead-end" hosts. In areas where the disease is endemic, the WNv has been found in mammals such as horses, camels, cattle, mice, hamsters, dogs, bats, and lemurs.

WNv was named after West Nile province of Uganda in which it was first isolated in 1937. Since then, it has been a well-documented cause of human disease in Africa, West Asia, and Eastern Europe. The first reported epidemics occurred in Israel during 1951-1954 and in 1957. European epidemics of WNv encephalitis have occurred in southern France in 1962, in southeastern Romania in 1996, and in south-central Russia in 1999. The largest recorded WNv epidemic occurred in South Africa in 1974. A major epidemic, with considerable mortality, began in Israel in the latter part of 2000.

Prior to the summer of 1999, occurrences of the West Nile virus had never been identified in the Western Hemisphere. The first known emergence of WNv in the Americas occurred in New York City in the late summer and fall of 1999, an epidemic which caused 61 confirmed human cases of encephalitis, of which seven were fatal. The method of importation of WNv is unknown, but it may have arrived in an infected human or bird (including a migratory bird), or in mosquitoes. Genetically, the 1999 New York City strain of the virus most closely resembled a strain that was identified in Israel in 1998.

During the winter of 1999-2000, the virus survived in mosquitoes in the New York City sewer system, and in the summer of 2000, the virus continued to spread. By 2002, the virus had spread to many U.S. states.

In 2001, WNv was confirmed for the first time in Ontario. Since then, the virus has spread to all provinces across Canada. Ontario had no cases recorded prior to 2002. In 2002, a total of 392 WNv cases in humans (307 confirmed and 85 probable) were reported.

PUBLIC EDUCATION, RISK COMMUNICATION AND COMMUNITY OUTREACH

Objective

To increase public awareness of WNv as a mosquito-borne disease; the surveillance activities and control techniques are underway, with emphasis on the personal protective measures individuals need to consider to reduce their risk of exposure to the virus.

Background

Ministry of Health and Long-Term Care "Fight the Bite" public education campaign

A multi-media, comprehensive public education campaign is the core component of the ministry's communication strategy for the 2003 season.

The campaign goal is to ensure everyone in Ontario has the information they need to protect themselves and their families from WNv. The public education campaign is designed to raise awareness and to ensure the public receives accurate, timely, and useful advice and information about West Nile virus.

The predominant public message emphasizes the prevention measures necessary to reduce the risk of acquiring the virus and subsequent illness. The April to October campaign will include print materials such as eight million copies of a brochure distributed to every home in Ontario, posters, a retail point of purchase promotion, and television, print and radio advertising. This effort will support the 37 local public health units in their fight against WNv and will use partnerships with other government ministries and major retailers to get the message out.

Health care provider outreach

Health care providers, especially those in acute care hospitals, must be informed about the human surveillance plan and be reminded to report cases of encephalitis or meningitis that meet the suspect case definition for WNv and which are, by regulation, reportable diseases in Ontario. As in past years, the Public Health Branch, MOHLTC will provide physicians with an education package on human surveillance, clinical information and diagnostic testing. The ministry will also provide the Ontario Hospital Association and Ontario Medical Association with copies of this Prevention and Preparedness Plan, 2003.

Public education activities within the local Health Unit

Public:

The public and other local community stakeholders will require information and updates about the surveillance activities and the risk assessment outcomes determined by the Medical Officer of Health regarding mosquito control activities. In particular, special-needs persons must be advised through appropriate means when adulticiding is planned and appropriately accommodated.

In terms of prevention measures, the general public education campaign message must be re-emphasized around personal protection against biting mosquitoes, including the application of approved insect repellent. Outdoor recreational and tourism groups and senior citizens' residences may be targeted for presentations and advice on personal protective measures. Parents, schools and day care centres need information on the use of DEET-containing repellent on children.

Public and stakeholder education is also needed at the local level to encourage "source reduction" to include eliminating major sites of standing water on private properties (residential or commercial) and on public properties (e.g., ditches, ponds, reservoirs, street catch basins, sewage treatment facilities, etc.). The importance of source reduction increases when mosquito-breeding sites have been identified close to residential sites. Source reduction at the local/regional level may involve the municipal departments of Public Works or Parks and Recreation, local conservation authorities, and the property owners themselves.

Furthering the public education message can also be accomplished with the use of school children (both elementary level and high schools), adolescents and senior citizens' groups as well as other community-based organizations. All of these groups are beneficial resources that should be encouraged to undertake standing water surveillance/source reduction in local neighbourhoods. Increased awareness among the members of this group will result in enhanced awareness for themselves, as well as result in local media coverage of activities which will further support Health Unit education or promotion activities.

Health Units are encouraged to continue their active community development role in such WNv education work.

Planned Activities

- If West Nile virus is found in a community, advisories will be issued to remind residents to:
  - Minimize time spent outdoors between dusk and dawn when mosquitoes are most active.
  - General public education "Fight the Bite" messages reinforced regarding protective clothing: Wear shoes, socks, long pants, and a long-sleeved shirt when outdoors for long periods of time, or when mosquitoes are most active. Clothing should be light-colored and made of tightly woven materials that keep mosquitoes away from the skin. The use of mesh "bug jackets" or "bug hats" is recommended.
  - Use mosquito netting when sleeping outdoors or in an unscreened structure and to protect small babies when outdoors.
  - Consider the use of mosquito repellents and use according to directions when it is necessary to be outdoors.

- With respect to personal property, general public education messaging should be reinforced to encourage the public to:
  - Remove any type of standing water:
  - Clean up and empty containers of standing water such as old tires, flower pots, wheelbarrows, barrels or tin cans that are outdoors
  - Change water in bird baths every other day.
  - Check swimming pools - remove water that collects on pool covers
  - Make sure the pools pump is circulating
  - Turn over wading pools when not in use.
- Check and clear eaves troughs and drains:
  - Clear obstructions from eaves troughs and roof gutters throughout the summer
  - Make sure drainage ditches are not clogged
  - Check flat roofs frequently for standing water.
- Carry out regular yard and lawn maintenance:
  - Lawn cuttings, raked leaves or other decaying debris such as apples or berries that fall from trees should be collected and recycled or mulched so that organic matter does not end up in storm sewers as a food source for mosquito larvae
  - The compost pile is not off limits to mosquitoes. Turn over compost frequently
  - Fill in low depression areas in lawns
  - Trim dense shrubbery where mosquitoes like to rest.

Local Source Reduction

Mosquito populations can be diminished significantly by reducing or eliminating their typical aquatic breeding habitats, a preventive strategy known as "source reduction". The major vectors of WNv in Ontario are the species of *Culex* which tend to breed in natural or artificial "containers" of standing water. Other vectors of WNv, such as certain species of *Aedes and Ochlerotatus,* prefer to breed in temporary floodwaters or semi-permanent pools of water, respectively (see Appendix 3, "Mosquitoes of Southern Ontario".) Municipal, local or regional authorities can engage in the following examples of source reduction activities:

- Conduct mapping of known or possible mosquito breeding habitats. In addition to existing paper maps, mapping tools such as a geographic information system (GIS) or global positioning system (GPS) unit will be helpful. If a municipal department (e.g., Public Works, Parks and Recreation, Roads or Transit) does not have GIS or GPS units, one of these tools may be available through local conservation authorities, or the district offices of the Ministry of Natural Resources (MNR) or the Ministry of Municipal Affairs and Housing (MMAH).
- Monitoring mosquito larval populations ("larval dipping") in bodies of stagnant water or in ditches/depressions 24 to 36 hours after major rainfalls. Storm water management ponds located in urban settings must be maintained with grass cut low on the edges of ponds. Urban drainage ditches and ground depressions may be drained, filled in, or regraded in order to prevent the accumulation of long-standing water or of periodic "rain pools".
- Wetlands must not be drained or altered in any way, unless there is an exceptional circumstance of significant human health risk from disease-vector mosquitoes. Consultation with, and permission from, the MNR and the appropriate conservation authority will be required.

- Store tires inside a garage or shed or other water-protected situation. Old tires left outside collect water after each rainfall and create perfect breeding sites for female mosquitoes to lay their eggs. Tires that have a function, such as anchors for tarps, should have several holes drilled in them to allow drainage. "Tire Drives" can be sponsored at the local level (i.e., encourage citizens to bring in old tires for recycling).
- Flush storm drains, catch basins and drainage ditches at least once per week or after each rainfall to remove stagnant water.
- Monitor sewage lagoons and retention ponds to ensure they are not breeding mosquitoes. Cut grass and remove vegetation around the banks of sewage lagoons.
- Initiate closer "personal service" contacts with community institutions (places of worship; homeowner associations; business groups; community service clubs) or initiate door-to-door promotion of mosquito breeding source reduction to industrial, commercial, recreational and residential property owners.
- Adopt municipal "show-by-example" activities to encourage source reduction and promote these activities at shopping malls, schools, community centres, etc.
- Promote mosquito breeding source site reduction campaigns by inserting fact sheets in taxation or local flyers.
- Offer presentations/displays at retail garden outlets, seniors' centres, and gardening clubs in order to increase awareness among persons more susceptible to WNv disease (e.g., older adults).
- Consider enacting by-laws to require mosquito breeding site (source) elimination or reduction, primarily in urban areas.
- Every effort and initiative must be considered to eliminate mosquito breeding sites on public and private property, both residential and commercial land.

Special-needs persons will be specifically addressed and given the guidance to accommodate their needs should adulticiding take place within the Health Unit boundary.

HOST (BIRD) SURVEILLANCE

Objective

To utilize the data from bird and mammal mortality as a means of early detection of West Nile virus activity as a means of predicting the potential risk of human WNv illness.

Background

In 2002, the number of animals identified that were infected by WNv, and which exhibited disease symptoms, increased considerably. A few of the animals identified with WNv included squirrels, wolves, dogs, mountain goats, muskrats, and sheep as well as a Barbary ape and various other animals at the Metro Toronto Zoo. In Ontario, other birds identified with WNv by the Canadian Cooperative Wildlife Health Centre include the Red-Tailed hawk, Great Horned owl, Coopers hawk, Sharp-shinned hawk, American robin, Great Black-backed gull, and the Canada goose.

In Ontario, corvids (i.e., crows, blue jays and ravens) are thought to be important hosts in maintaining the endemic host–vector cycle of viral transmission. The degree to which other animals and birds contribute to the host–vector cycle has yet to be determined. Some animals are considered to be "dead end" hosts (e.g., horses and humans) since there is no further transmission to another species. These "dead end" hosts are unlikely to transmit the virus via the mosquito vector because the amount of virus circulating in the hosts blood is insufficient.

Planned Activities

- The surveillance of dead crows for WNv remains a public health activity for 2003.
- In 2003, dead crow surveillance activities, which began this year on April 15, will be phased in based on the schedule distributed to the Health Units by the Canadian Cooperative Wildlife Health Centre. The goal is to intensively test earlier than previous years in those Health Unit areas most affected in 2002 in order to identify WNV-infected birds as early as possible.
- Health Units will collect and submit dead crows (and those Health Units in the north may include ravens)
- The dead crows will be submitted for VecTest™ testing to the Canadian Cooperative Wildlife Health Centre in Guelph. Results will be sent to the submitting Health Unit and to the Public Health Branch, MOHLTC simultaneously with the results posted to the MOHLTC website.
- Dead crow sightings data were being received by CCWHC on their website as of May 1, 2003 as a Health Unit operational option. Those Health Units wishing to utilize this database service should contact Ron Templeman at ron.templeman@usask.ca for operational details.

"Sightings" Synopsis

At the request of many Health Units, the MOHLTC will record dead crow sightings reports on its website on a weekly basis. Participating Health Units are requested to submit their dead crow sighting data to the Public Health Branch on each Wednesday for the previous week. Health Units will need to get the message out within their community, via public service announcements, regarding the Health Unit's program for collection of bird samples and which

type of bird (only crows) the public should call in as part of the dead bird sightings reports, in order to manage the potential volume of calls.

VecTest™

For 2003, a new WNv screening tool, known as the VecTest™, is now available and will be utilized by CCWHC. This test involves taking a swab of the oro-pharangeal area (nostrils or more correctly, the nares). The tests provide confirmatory test results within 15 minutes.

Initially, the National Microbiological Laboratory in Winnipeg will confirm one VecTest™ result in a series to validate the indicated findings. All VecTest™ positive results will be reported directly by CCWHC to the Health Unit involved, to the Public Health Branch, and to Health Canada.

The VecTest™ is 85% sensitive and 95% specific. Sensitivity is the ability of the test to detect the disease when it is present. (A lack of sensitivity increases the rate of false negatives.) Specificity is the ability of a test to detect the absence of disease. (A lack of specificity increases the rate of false positives.)

Scheduling for Dead Bird Surveillance

All scheduling of dead bird testing is the responsibility of the Canadian Cooperative Wildlife Health Centre. CCWHC has advised that, should a broad infection rate among submitted birds in a given area become evident, they reserve the right to change the scheduling of bird submissions accordingly.

Dead Bird Submission Schedule for 2003	
As of April 15	• Windsor-Essex; Chatham-Kent; Lambton; Elgin-St. Thomas; Middlesex-London; Oxford; Brant; Haldimand-Norfolk; Niagara; Hamilton; Halton; Peel; Toronto; York Region; Durham
Commencing May 5	• Health Units in the remainder of southern Ontario south of Muskoka-Parry Sound and Renfrew extending from Lake Huron to Ottawa and Eastern Ontario
From May 5 onward	• all Health Units are to ship no more than four (4) dead crows per week
Beginning May 20	• remaining Health Units in the northern parts of the province may begin shipping dead crows and ravens

Shipping Protocol

Shipments should be made "PUROLATOR COLLECT", and pre-printed labels and submission forms will be sent to each Health Unit by CCWHC before their respective start date.

For further details concerning the protocol for reporting and submission of dead bird specimens in Ontario, please refer to the protocol in **Appendix 1, "*The Handling and Submission of Specimens - Ontario West Nile Response*", by Dr. Ian Barker of the Canadian Cooperative Wildlife Health Centre in Guelph.**

HUMAN SURVEILLANCE

Objective
To rapidly detect WNv illness in humans.

Background:

Human Clinical Manifestations
The clinical manifestations of West Nile virus illness and long-term conditions resulting from WNv disease continue to be identified as scientific literature becomes available. The incubation period ranges from 3 to 14 days.

Planned Activities
The activities for human surveillance will be implemented throughout the healthcare system and involve family physicians, community hospitals, public health laboratory service, the local Medical Officer of Health and the Public Health Branch of the Ministry of Health and Long-Term Care. In addition, surveillance information is shared with Canadian Blood Services to ensure the safety of Canada's blood supply.

Human surveillance is based on the use of the following information:

WNv Illness - Based on the national case definition provided by Health Canada for reporting the disease, "WNv Illness" can be considered to consist of two clinical pictures, "WNv Fever" and "WNv Neurological Manifestations". There is also a case definition for "WNv Asymptomatic Infection" (See Appendix 6). Data from the U.S.A. indicate that most WNv infections are often clinically not apparent or mild. Approximately 20% of people infected develop a mild illness (WNv Fever), or as cited in public education literature, 4 out of 5 people who become infected with WNv do not show any symptoms. Approximately 1 in 150 (0.7 %) of infections will result in severe neurological disease. Current data indicate that the most significant risk factor for developing severe neurological disease remains advanced age.

WNv Fever (or *"West Nile Fever"*) is the milder form of WNv Illness. Clinical symptoms include a febrile illness of sudden onset plus one or more of the following: malaise, anorexia, nausea, vomiting, headache, eye pain, photophobia, arthralgia, myalgia, and maculopapular rash. The complete clinical spectrum may not yet be fully identified.

WNv Neurological Manifestations: The clinical picture of WNv Neurological Manifestations may include the symptoms of WNv Fever. Symptoms of encephalitis are more commonly reported than meningitis. In addition to WNv fever symptoms, manifestations may include change in mental state, severe muscle weakness, flaccid paralysis, myelitis, seizures, polyradiculitis, cranial nerve abnormalities including optic neuritis, ataxia and extrapyramidal signs. Conditions identified in 2002 include poliomyelitis-like syndrome, acute flaccid-paralysis, and rhabdomyolysis.

Modes of Transmission

The mosquito vector is the mode of transmission that accounts for the majority of human infections. In 2002, several new modes of transmission were identified. These modes included human bloodborne transmission, vertical transmission via mothers milk and intra-uterine transmission, and transmission via occupational hazards in the case of laboratory workers. Mention of risk of transmission to hunters is also noted as a result of potential transmission from infected animal tissues.

Bloodborne Transmission

Transmission of WNv via human blood and organs has been documented in several cases in the U.S.A. The initial reports are available in Morbidity and Mortality Weekly Report (MMWR) October 4, 2002/51(39);879. Transmission via human blood transfusion was considered the most likely source of one individual in Ontario in 2002. Bloodborne transmission is also being investigated as the source of infection in four other cases.

Vertical Transmission

Maternal Milk

Transmission of WNv from mother to infant via the mothers milk was considered the most likely source of an infants infection in one case-report. The report is available from MMWR October 4, 2002/51(39);877-878.

Intrauterine Transmission

Intrauterine transmission of WNv is documented in MMWR December 20, 2002/51(50); 1135-1136.

Occupational Hazards

Reports of WNv infection in laboratory workers acquired through percutaneous injection while handling infected birds are available in MMWR December 20, 2002/51(50); 1133-1135. It is recommended that laboratory workers handling fluids or tissues known to be, or suspected to be, infected with WNv should minimize their risk for exposure. Laboratory workers should follow standard universal precautions and use good laboratory practices and techniques as outlined in their facility's policy for managing exposure to blood-borne pathogens when handling tissues or fluids known or suspected to be infected with WNv.

Hunters

As a result of the potential for transmission of WNv via infected animal tissues, the Centers for Disease Control and Prevention in Atlanta, Georgia, have issued warnings to wild game hunters to use prophylactic measures when handling animal carcasses. For information, hunters are directed to the following website: http://www.cdc.gov/ncidod/dvbid/westnile/q&a.htm.

Reportable Disease Requirements in Ontario

"WNv Illness" is both a Reportable Disease and a Communicable Disease under the *Health Protection and Promotion Act*, Regulation 558/91 and 559/91, respectively as of May 1, 2003. In addition, under Regulation 338/96, the name and other personal information of WNv illness cases must be provided to Canadian Blood Services for the purpose of protecting blood products where there are reasonable grounds to believe that the person has or may have been

a blood recipient or donor. The May 21, 2003 version of the WNv case definition is attached to the end of this document.

The following provides reporting responsibilities by selected agencies:

- Central Public Health Laboratory
  a) Reports WNv positive laboratory results to, in order of priority:
     - Physician (note – both positive and negative results are reported to physician)
     - Local Medical Officer of Health
     - Public Health Branch
  b) Reports the name and other personal information of WNv suspect cases to the Public Health Branch, for the purposes of reporting to Canadian Blood Services.

- Public Health Branch, Ministry of Health and Long-Term Care
  - As per Regulation 338/96, reports the name and other personal information of WNv suspect cases received from the Central Public Health Laboratory to Canadian Blood Services.

- Physician
  a) Reports human WNv *suspect, possible, probable*, and *confirmed* cases, as per any reportable disease, to the local Medical Officer of Health
  b) As per Regulation 338/96, reports the WNv suspect cases name, date of birth, and date of onset of symptoms to the local Medical Officer of Health, where there are reasonable grounds to believe that the person has or may have been a blood recipient or donor.

- Local Medical Officer of Health
  a) Reports the WNv suspect cases name, date of birth, and date of onset of symptoms, received from physicians, where there are reasonable grounds to believe that the person has or may have been a blood recipient or donor to Canadian Blood Services;
  b) Reports information on human WNv *possible, probable* and *confirmed* cases to, in order of priority:
     - Canadian Blood Services – "blood transmission" information included on pages one and two of the WNv questionnaire should be faxed, as per instructions on the questionnaire, to the PHB. The PHB will forward this information immediately to CBS;
     - PHB – provide a completed "WNv" questionnaire. With the full implementation of RDIS across all Health Units, the WNv questionnaire will then be discontinued.

Note:
Health Unit staff are asked to contact acute care hospitals in the Health Unit on a weekly basis to ensure active surveillance for WNv cases is being implemented.

- Canadian Blood Services
  a) In keeping with the CBS protocol for traceback for donors or recipients, a recent report from the *West Nile Virus Hospital Contingency Planning Task Force on Blood Recommendations* has made recommendations. These will ensure the continued safety of Canada's blood supply with ongoing and, if necessary, duplicated communication mechanisms in place to ensure no gaps in the transferring of important information in the event that CBS identifies a positive blood test in a blood donor or the public health services determine a potential threat to the blood supply. It is anticipated that these recommendations will be implemented. The reporting priority is:
     1. Donor
     2. Physician
     3. Local Medical Officer of Health

Surveillance for West Nile virus Illness (Case Definitions)

Ontario's WNv case definition (see Appendix 6 for details) is based on Health Canada's case definition as drafted to date, and will be proactively implemented for 2003. At the time of writing, Health Canada's case definition had not been completed. Ontario's case definition will be updated in order to be consistent with the Health Canada case definition upon completion. Both Ontario's and Health Canada's case definitions were drafted with available information at the time of writing. Case definitions and diagnostic test criteria are subject to change as new information becomes available.

For surveillance purposes, WNv illness will consist of WNv Neurological Manifestations (WNNM), WNv Fever (WNF), and WNv Asymptomatic Infection (WNAI). WNNM and WNF will each consist of the categories "Suspect", "Possible", "Probable", and "Confirmed", and WNAI will consist of the categories "Probable" and "Confirmed", respectively, depending on laboratory diagnostic test results.

The case definitions have two criteria for each of WNNM, WNF, and WNAI. One criterion is based on clinical features of the illness and the other criterion is based on laboratory test results.

WNv Case Categories

This table provides a summary of the various categories of WNv cases identified by the interpretation of the primary laboratory-screening test, IgM ELISA. For additional information on other laboratory tests and specific clinical criteria, please refer to the Case Definition document included with this package.

	Category	Clinical Criteria	Laboratory Criteria
West Nile virus Neurological Manifestations	Suspect	Yes	Pending
	Possible	Yes	Serum IgM ELISA Indeterminate
	Probable	Yes	Serum IgM ELISA Positive
	Confirmed*	Yes	Serum IgM ELISA Positive + Confirmation by PRNT
West Nile virus Fever	Suspect	Yes	Pending
	Possible	Yes	Serum IgM ELISA Indeterminate
	Probable	Yes	Serum IgM ELISA Positive
	Confirmed*	Yes	Serum IgM ELISA Positive + Confirmation by PRNT
West Nile virus Asymptomatic Infections	Probable	No	Serum IgM ELISA Positive
	Confirmed*	No	Serum IgM ELISA Positive + Confirmation by PRNT

*** Note: After five cases have been confirmed by PRNT in a Health Unit area, cases meeting the probable laboratory criteria will be classified as confirmed cases.**

MOSQUITO SURVEILLANCE

Objective

To identify the local areas where the presence of WNv poses the most direct threat to humans.

Background

Mosquitoes are the vectors that maintain the host–vector cycle of viral transmission. In Ontario, mosquitoes can be categorized into two types, "bridge" vectors and "enzootic" vectors, based on the species affinity for biting humans.

"Bridge" vectors consist of mosquito species that feed from birds and humans, and thus pose a risk to humans.

"Enzootic" vectors primarily feed from birds, and thus maintain the host–vector cycle of viral transmission. There may be considerable overlap between the two categories in that "enzootic" vectors may occasionally feed from humans.

In Ontario, a cumulative total of 598 pools consisting of two enzootic vectors and six bridge vectors were laboratory confirmed with WNv by year-end of 2002. These WNV-positive mosquitoes were identified in 19 Health Unit jurisdictions.

A recent study has established that a WNv-infected mosquito does not indicate that the mosquito is a confirmed vector, or will potentially transmit the virus. If the virus is present in the mosquitoes intestinal tract after a blood meal, the mosquito is infected but cannot transmit the virus. The virus must be in the mosquitoes salivary glands in order to infect an individual. The *extrinsic incubation period* (EIP) is the time from ingestion of virus to the time it is present in the salivary glands. If the mosquitoes life span is less than the EIP, the mosquito cannot transmit the virus.

Planned Activities

- Mosquito surveillance in Ontario in 2003 will enumerate and identify the species of mosquitoes present in the various Health Units in order to:
  - assist Health Units with vector data in their risk assessment to support the decision to larvicide or adulticide;
  - assist in providing information about the risk to the public of acquiring WNv Illness based on the presence of WNv within specific local areas.

- Health Units are requested to share their mosquito surveillance data as soon as possible with the MOHLTC for posting on the MOHLTC website.

- Mosquito surveillance in 2003 is planned to take place:
  - between May 26 and October 10, a period of 20 weeks in southern Ontario; and
  - between July 28 and October 3, a period of 10 weeks in northern Ontario.

Three-Tiered System For Mosquito Collection

The data gathered from the public health activities across the province in 2001 and 2002 have been used to design a three-tiered system based on WNv presence in 2001 and 2002 for WNv risk projection. This system will maximize the resources and facilities available at Brock University. The tier structures are:

Tier 1 and 1(a)

- 1 - High Human Population + moderate WNv bird activity in 2001 and 2002 + moderate incidence of WNv in humans (5 traps per week over 20-week period)
  - Durham; Hamilton-Wentworth; Middlesex-London; Niagara; Windsor-Essex; York Region

- 1 (a) - Very High Human Population + high WNv bird activity in 2001 and 2002 + high incidence of WNv in humans (15 traps per week over 20-week period)
  - Halton; Peel; Toronto

Tier 2

- Moderate Human Population + lower WNv bird activity in 2001 and 2002 + lower WNv incidence in humans (5 traps every other week over 20-week period)
  - Brant County; Chatham-Kent; Eastern Ontario; Elgin-St. Thomas; Grey Bruce; Haldimand-Norfolk; Haliburton-Kawartha-Pine Ridge; Hastings-Prince Edward Counties; Huron; Kingston; Lambton; Leeds-Grenville and Lanark; Muskoka-Parry Sound; Oxford; People Services Branch (Ottawa-Carleton); Perth; Peterborough County-City; Simcoe; Renfrew; Waterloo; Wellington-Dufferin-Guelph

Tier 3

- Lower Human Population + lowest WNv bird activity in 2001 and 2002 + little or no WNv incidence in humans (5 traps per week over 10-week period)
  - Algoma; North Bay; Northwestern; Porcupine; Sudbury; Thunder Bay; Timiskaming

Mosquito Traps

Only CO_2-baited Centres for Disease Control light traps will be used. "Gravid" traps will no longer be used.

Health Units were provided with the appropriate number of CDC light traps prior to May, as indicated the initial version of the Plan.

Training will also be provided for Health Unit staff who did not participate in adult mosquito surveillance in 2002.

Enumeration and Species Identification training will be provided at Brock University.

Testing of Mosquito Pools for WNv

WN viral testing for mosquito pools will be provided by Brock University in 2003.

EQUINE (HORSE) SURVEILLANCE

Objective

To monitor WNv in horses throughout the province to support data on the presence of the virus as an indicator of its epizootic transmission to mammals and of its general impact on local communities.

Background

WNv in horses often occurs concurrently, or sometimes just prior, to confirmation of human infection. The 1999 New York experience depicted equine cases in advance of human cases and in low populated areas where there was no other non-human evidence. Thus, equine surveillance may be important, particularly in rural settings, as an indicator of West Nile virus activity and of human risk.

Vaccine

An equine vaccination product is available from veterinary practitioners in North America. The Ontario Ministry of Agriculture and Food continues to promote the WNv vaccination of horses to large animal veterinarians in Ontario. Equine practitioners can send serum samples to the Veterinary Service Laboratory in Guelph for analysis. While there is no federal policy for action on equine WNv, the Canadian Food Inspection Agency must be notified of any case of equine WNv.

Equine cases in Ontario were first reported in 2002. A total of 101 confirmed and 6 probable cases was reported. Of the confirmed cases, 38% (38/101) were from Essex County. Of the 17 Health Units involved, 7 were in South West Ontario, 5 in Central West Ontario, 2 in Northern Ontario, 1 in Eastern Ontario and 2 in Central East Ontario.

Planned Activity

Reporting to MOHLTC

The Ministry of Agriculture and Food has agreed to provide the data they receive to the Ministry of Health and Long-Term Care, and the information will be shared with the Health Units upon receipt.

LARVAL AND ADULT MOSQUITO CONTROL

Objective

To reduce the abundance of adult mosquitoes through the use of Integrated Pest Management techniques.

Background

All mosquitoes begin their life in water. *Culex pipiens*, a primary enzootic vector of WNv and one of the most common mosquitoes found in northern urban areas, breed quickly and use standing or slow-moving water to lay their eggs in decaying, organic materials. Prime breeding sites include discarded tires, poorly maintained bird baths, clogged drain gutters, unused swimming and plastic wading pools, pots and pans with standing water, and puddles that last for a week or more.

Potential enzootic vectors (tested positive in 2002 season)		
Species	**Relative Frequency**	**Active**
Culex pipiens	common	night active
Culex restuans	common	night active

Potential bridge vectors (tested positive in 2002 season)		
Species	**Relative Frequency**	**Active**
Aedes vexans	Common	night active
*Coquilletidia perturbans**	Common	night active
Culex salinarius	Not common	night active
Ochlerotatus triseriatus	Not common	day active
Ochlerotatus trivittatus	Not common	day & night active
Anopheles punctipennis	Not common	day & night active
The following species are found in Ontario, but are relatively rare (tested positive for WNv in the USA, but not in Canada; implicated as potential bridge vectors in the USA)		
Species	**Relative Frequency**	**Active**
Anopheles quadrimaculatus	Not common	day & night active
Ochlerotatus canadensis	Not common	day active
Ochlerotatus sollicitans	Not common	day active

* *Coquilletidia perturbans* larvae are unusual among mosquito larvae in that they are found in soft mud attached to the bases of submerged aquatic plants in marshes; they obtain their oxygen from air tubes within the roots of several aquatic plants including cattails, water-lilies, reeds, sedges, water-arum, pickerelweed and arrowhead.

Planned Activities

- Eliminating breeding sites is the simplest and most effective way to reduce the number of mosquitoes. The MOHLTC-mounted public education campaign "Fight the Bite" emphasizes personal protective measures and homeowner guidelines to reduce mosquito breeding sites on personal property. Local Health Units should emphasize elimination of breeding sites within their local communities, including commercial sites, which are often significant sources of potential breeding.
- "Larviciding" is the use of approved insecticides against the larvae of mosquitoes or other insects. Larvicides are usually dispensed in the form of pellets or granules that are dropped into pools or containers of standing water where mosquitoes are breeding. Larvicides can be biological or chemical products. This year, there is a larvicidal product that homeowners can purchase from licensed retail outlets for use around their private property, and do not need an application permit from the Ministry of the Environment. Community-based applications do require a licensed permit from Ministry of the Environment and must be applied by trained and licensed staff.

- "Adulticiding" refers to the use of approved pesticides against the adult stage of insects. Adulticides are chemical products in liquid form that are aerosolized and "sprayed" into the air. ("Fogging" is a more accurate term when the adulticides are conveyed as ultra-low volume (ULV) droplets). Adulticides may be delivered by backpack sprayers, truck-mounted foggers, or by aerial means.

Decision-Making and Consultation

The decision to employ mosquito larviciding or adulticiding is established through Regulation 199/03 (See Appendix 7). The determination of where to apply the larviciding or adulticiding requires a local risk assessment. The assessment should weigh the level of risk to public health from the mosquito-borne virus based on the most current, available evidence of local WNv activity in the human population and in non-human species (dead birds, mosquito pools and/or equines). All of these factors, plus taking into account all other control measures available are incorporated into weighing the expected benefits and risks of pesticide use. The risk assessment should also take into account all of the existing non-pesticide means of mosquito reduction and the measures available to prevent or reduce disease transmission such as personal protective measures against biting mosquitoes.

The local Medical Officer of Health is the appropriate official to make a decision after receiving the aforementioned information from Health Unit staff and other municipal or regional agencies and, if necessary, from consultation with provincial, federal or private sector expert authorities.

General Decision-Making Factors re Larviciding and Adulticiding

A local risk assessment is the most critical prerequisite to decision-making regarding where and when to commence active mosquito control. That assessment must be based on the most current and accurate data available, e.g.,

- evidence of West Nile virus human illness or mortality in the Health Unit jurisdiction, with consideration of the situation in adjacent jurisdictions;
- the trend in local human morbidity or mortality that indicates the relative urgency of the risk to human health;
- the demographic and geographic distribution of the human population at risk;
- the local distribution, density and (if available) species identification and virus infection rates of known or potential vector mosquito populations;
- the nature and location of the mosquito breeding site(s) to be treated, including the type of container or body of water, and its proximity to human populations at risk and the ease of access to insecticide applicators;
- other local surveillance findings (e.g., the trends in the numbers of dead bird sightings or of virus-infected birds or mammals);
- the time of season and local weather conditions (temperature, rainfall, winds);
- the relative effectiveness and safety of the pesticide product, as evaluated by federal authorities, and the regulatory requirements of provincial and federal authorities (see Appendix 2; and,
- community and stakeholders' attitudes towards the risks posed by the West Nile virus versus the likely benefits and risks of larviciding or adulticiding in those locations identified by the risk assessment.

While seniors and the immuno-compromised are at relatively greater risk of serious illness, once infected with the virus, consideration of this factor should be balanced against the knowledge that infection and serious illness have occurred in a wide range of ages in Canada and the U.S.A. In the current public education "Fight the Bite" campaign, prevention messages state that "everyone is at risk".

Registration and Regulation of Pesticide Use in Canada

Federal and provincial regulations regarding the use of larvicide or adulticide, as for other registered pesticides in Canada, must be followed. (See Appendix 2 for provincial Ministry of the Environment regulations; for the federal authority, please contact the Pest Management Regulatory Agency by phoning 1-800-267-6315 or via the Health Canada website at: www.hc-sc.gc.ca/pmra-arla/english/index-e.html.

Larvicides

There are biological and chemical larvicides presently registered for use in Canada.

The primary biological (microbial) larvicide registered in Canada is a form of bacterial spore called *Bacillus thuringiensis israelensis* ("*Bti*" for short). Following ingestion by the mosquito larva, the *Bti* spores release crystallized toxin in the larva's stomach which causes death. Safety evaluation of *Bti* application for larval control has shown little or no risk to wildlife or other non-target species, or to human health, if accidentally ingested. The *Bti* toxin is released in the alkaline environment of the insect larva's stomach, whereas human and animal stomachs have acidic environments.

Bti may be applied to irrigation ditches, flood ditches or pastures, marshes, woodland pools, standing ponds, or storm water retention ponds. Timing of *Bti* applications is important: the 2nd or 3rd instar stages of the larva are targeted. Although the 1st instar stage is susceptible, targeting the later instars ensures that all the eggs were hatched prior to application. The limited treatment window is a relative disadvantage. Because of its short residual activity, *Bti* may need to be applied frequently to have a sustained effect; this can be labour-intensive and costly.

A domestic-quantity formulation of *Bti (Aquabac)* has recently become available to homeowners through licensed retail outlets for application on private property. Homeowners do not need a permit from the Ministry of the Environment to apply this domestic *Bti* product on private property.

Methoprene is sometimes called a "biorational" compound because it is a synthesized version of naturally-occurring compounds, in this case, a "juvenile-stage" hormone found in mosquito larvae. Methoprene arrests the development of larvae so that adults do not emerge to carry the disease. Methoprene is administered when the larvae are mainly in the later instars. Methoprene comes in slow-release formulations, which can be placed in difficult-to-reach locations.

Methoprene "does not pose unreasonable risks to wildlife, people, or the environment" (see reference #1 at the end of this section). It breaks down quickly in water and soil and does not leach into groundwater. Methoprene has low toxicity to birds and fish and is non-toxic to bees. Reports of frog abnormalities have not been verified. However, methoprene is toxic to some aquatic invertebrates such as crayfish. The Pest Management Regulatory Agency (PMRA) has included special precautions on the label. Methoprene use does require a permit from Ministry of the Environment and must be applied by trained and licensed staff.

Diflubenzuron is another insect growth inhibitor that disrupts the moulting process by inhibiting the synthesis in the insects exoskeleton formation, leading to desiccation and death. It is seldom used because it will also inhibit the exoskeleton development of other insects or crustaceans.

Chlorpyrifos is effective and less expensive than *Bti* or methoprene. However, the Pest Management Regulatory Agency has recently restricted the use of chlorpyrifos to areas where children do not live or play.

Fenthion is rarely used as a larvicide because of its toxicity to birds. (It is also registered as an adulticide.)

Larviciding Equipment

Two types of larviciding equipment may be used, for solid (granule or pellet) or liquid formulations. The equipment may be manually or power-operated, and hand or shoulder-carried, or can be mounted on All-Terrain Vehicles (ATVs), trucks, or aircraft.

Solid or "dry" larvicides may be applied directly by hand or from a tank (carried on the applicators back) that ejects the granules or pellets by means of a gravity-fed hopper, a manually-cranked dispenser, or a powered auger. These methods are useful for treating small areas (catch basins, ditches, or other containers or small bodies of water) around which the applicator can position himself or herself appropriately and dispense small amounts of larvicide.

For treating larger areas, powered backpack blowers may be used to spread granules farther away from the applicator, and these blowers can also be mounted on ATVs. Truck-mounted blowers are used, for example, to treat wide roadside ditches over a distance. Should very large areas need treatment, granule spreader systems can be mounted on fixed-wing or rotary (helicopter) aircraft.

Liquid larvicides (which are less commonly used) may be dispensed by a hand-held compressed-air sprayer or by a powered backpack sprayer. Like the powered granule blowers, these liquid sprayers may be mounted on ATVs or trucks to treat larger areas. Liquid larvicides are rarely applied by aerial means because very large mosquito breeding habitats would likely have heavy vegetation or wooded areas and the liquid would not penetrate such cover as well as solid formulations.

Mechanical Means of Larval Control

There are also mechanical means of larval control; these are newly available and are being site-tested. Such mechanical measures include sonic devices (utilizing sound waves to disrupt larval development), and devices for the vacuuming or agitation of the standing water in containers (such as catch basins) to disrupt larval breeding.

Adulticiding

A local risk assessment is an essential prerequisite in the decision-making regarding the need to adulticide and where and when to start an adulticiding program. The decision that it will be done is guided by the Table provided in O. Reg. 199/03 (see Appendix 7), and where to do it will be identified in the risk assessment as those local conditions which present the most significant and immediate risk to public health. Adulticiding must be included as part of any assessment grid in order to represent the complete spectrum of control measures. However, adulticiding is frequently considered as a "last resort", therefore the greater emphasis focuses on larviciding programs as the means of proactive prevention and the foundation in mosquito reduction and control.

A component of the risk assessment is drawn from experiences in other jurisdictions that have provided information on the other measures of prevention or control that have either been tried and shown to be inadequate, or would clearly not be effective if instituted anew (*see below*). The "General Decision-Making Factors re Larviciding and Adulticiding" above should be considered.

Whether or not larviciding has already been done in the jurisdiction, the urgency of the threat to human health from mosquito-borne virus may dictate the need to adulticide as indicated by the Table in O. Reg. 199/03. (Since it seeks to prevent the emergence of the next generation of mosquitoes, larviciding will not immediately reduce the population of flying adults, a percentage of whom will be carrying the virus and seeking "blood meals".)

Seasonal timing is also important. From about mid-to-late August, larviciding will have very limited effect in preventing the transmission of mosquito-borne virus in Ontario's temperate climate because subsequently emerging adults will not be seeking blood meals but, instead, will be going into "diapause" to prepare for the oncoming cold season. At that point, adulticiding would be the only urgent mosquito control measure available if existing non-pesticide measures were not preventing further spread of West Nile virus.

The Pest Management Regulatory Agency has registered six active ingredients as adulticides for mosquito control in Canada: malathion and dichlorvos (organophosphate class of insecticide), propoxur (carbamate class), and resmethrin and two synergized pyrethrin products (pyrethroid class). The classes of insecticides reflect the different modes of action on the central nervous system of mosquitoes that cause lethality. All six products have been registered for ground-based applications but only malathion and propoxur have been registered for aerial application (from fixed or rotary-wing aircraft). The PMRA is presently close to completing its re-evaluation of malathion for adult mosquito control.

Whether delivered by ground or aerial means, Ultra Low Volume (ULV) fogging is generally recommended over thermal fogging because a lower volume of insecticide is used. ULV fogging uses a water-based carrier rather than oil-based (with thermal fogging) and application costs may be lower.

For more information about specific adulticides, please contact the Pest Management Regulatory Agency by phoning 1-800-267-6315 or via the Health Canada website at: www.hc-sc.gc.ca/pmra-arla/english/index-e.html.

Monitoring the Effectiveness of Vector Control Measures

Following larviciding or adulticiding, the relative numbers of adult mosquitoes collected in light traps should be compared to the numbers collected immediately prior to the insecticide application, or the numbers collected in adjacent "untreated" areas. Landing or biting counts of mosquitoes on human volunteers is another way of enumerating a relative reduction in mosquito exposure following control measures. Monitoring the frequency of local citizen complaints of mosquitoes or mosquito bites is less precise, and has been used as a more subjective method to evaluate nuisance control.

For larviciding, a more specific and immediate field evaluation of effectiveness would be continued sampling of larvae before and after treatment, to compare the numbers of larvae per dip or per square metre of the body of water. The general aim of larviciding is to obtain 95% control within 24 hours of application after all label directions have been followed.

Reasons for the "failure" of these control measures are varied, and may be related to incomplete consideration of the "*General Decision-Making Factors*" described above, or to having inadequate or outdated data with which to consider these factors. It is acknowledged that the impacts of larviciding or adulticiding may be extremely dependent on the many variables outlined affecting local conditions, i.e., weather conditions, and situations i.e., mosquito counts, and proximity to residential areas.

Weather conditions, for example, influence both mosquito populations – their distribution (e.g., strong winds may blow mosquitoes in from outside the "control zone") and the extent and rapidity of their breeding (high temperatures or humidity) – and the effectiveness of the insecticiding, especially adulticide fogging. In addition, there may have been implementation errors or barriers, such as applicator errors, inadequate numbers of staff or application equipment, or improper calibration of the equipment.

Because the issue of how well a mosquito control program has been implemented would vary in different jurisdictions and at different times, it is difficult to make *a priori* generalizations about the expected effectiveness of larviciding or adulticiding in preventing mosquito-borne virus transmission to humans or other host populations. The insecticide products, however, have been evaluated and approved for their general effectiveness in reducing mosquito populations when used according to the label.

SURVEILLANCE OF POTENTIAL ADVERSE HEALTH EFFECTS FROM PESTICIDE EXPOSURE

Objective
To monitor for possible adverse health effects that are attributable to larvicide or adulticide exposure.

Background
Since exposure to any pesticide has the potential to cause adverse reactions, each Health Unit is required to ensure, as a minimum, that the advance notification requirements of the Ministry of the Environment are followed, so that persons with pre-existing respiratory conditions (e.g., asthma) or sensitivities to pesticides have reasonable opportunity to take precautions to avoid or minimize exposure. The time period and methods of advance notification are stated in Appendix 2.

Under the *Health Protection and Promotion Act*, O. Reg. 199/03, Health Units are to record, investigate and report any confirmed or likely adverse or unintended human health effects attributed to mosquito control actions, and will report any non-human environmental adverse effects to the Ministry of the Environment and other relevant local or provincial authorities.

Planned Activity
As part of their active surveillance communications with local hospitals for WNv illness, the Health Unit is asked to monitor for any reported cases of adverse health effects attributed to pesticide exposure from adulticiding or larviciding. In order to assess the nature or likelihood of the exposure of the affected persons, the Health Unit may have to work with the MOE (District Office or regional pesticide specialist), the licensed exterminator, and/or municipal agencies involved in either the adulticiding/larviciding work or the local environmental monitoring, as well as with health care provider(s) in obtaining these persons' history of exposure.

RESEARCH AND EVALUATION

Objective
To better understand the ecology of WNV in Ontario and to assess the effectiveness of surveillance, prevention and control methods toward the reduction of WNv illness.

Background
Given the large number of mosquitoes in the province of Ontario, it is necessary to monitor the success of the work being undertaken through larviciding in particular toward the reduction of the mosquito population. It is also necessary to maintain regular contact with colleagues throughout North America to ensure that we are privy to the latest thinking on WNv control. Original research, as noted below, is also a component of the Ontario plan.

Planned Activity
- The MOHLTC shall weekly, and more frequently, if necessary, hold open communication with all Health Units through teleconference and e-mail to determine what is happening across the province and to share data, information of successes and of problems.

- The MOHLTC is working with McMaster University to conduct a WNv seroprevalence study. The purpose of the study is to estimate the seroprevalence of West Nile virus antibody amongst people living in southern Oakville during the summer of 2002. The study will also try to determine some of the risk factors for WNv infection and assess knowledge, beliefs, attitudes and factors associated with risk reduction behaviours in this population.

- The MOHLTC is supportive of the epidemiologic analysis of 2002 data as planned by the CCWHC in conjunction with Health Canada to evaluate the usefulness of a dead crow-sighting index as a predictor of WNv activity.

- The MOHLTC will be evaluating the information on WNv vectors at the local level. The assessment will evaluate whether such information on the viral status of mosquito pools provided a valuable component in the risk assessment or was value neutral. This information will contribute to determining the level of mosquito surveillance needed in subsequent years.

Dead Bird Surveillance for West Nile Virus
Ontario - 2003
Ian K. Barker - 03.03.20

Strategy

The goal is to detect crows and ravens dead of West Nile Virus as early as possible, in light of the probability that, at least in the very southern tier of Health Units in Ontario, where WNV was active in 2001 and 2002, the virus has overwintered in mosquitoes. This may permit early initiation of the amplification cycle in the warmer parts of Ontario. The probability of a mosquito carrying WNV later in the summer/fall is a function of time and temperature over the amplification cycle (higher temperatures shorten mosquito life cycles, and shorten the time taken for mosquitoes infected with WNV to become infectious for other birds or mammals). Hence, the earlier the amplification cycle is initiated, the higher the risk of transmission to people and mammals later in the season.

The initial stages in the process will not change from last year: public education to detect and report dead crows to the health unit; and the health unit shipping birds by courier collect to the Canadian Cooperative Wildlife Health Centre Ontario/Nunavut in Guelph. Modifications in the detection and reporting of WNV infected crows have been made to shorten the test turnaround time, and are described below. And sightings of dead birds will not be entered in the CCWHC database, since, in Canada, the utility of such data in surveillance as a surrogate for dead bird testing, or as a means of quantifying regional risk of infection, has yet to be substantiated.

Time of Initiation of Dead Bird Surveillance

Beginning Tuesday April 15, CCWHC will receive dead crows from the southern tier of Health Units (Windsor-Essex, Chatham-Kent, Lambton, Elgin-St. Thomas, Middlesex-London, Oxford, Brant, Haldimand-Norfolk, Niagara, Hamilton, Halton, Peel, Toronto, York, and Durham). These Health Units each can submit up to 6 dead crows/week, up until Thursday May 1.

Beginning Monday May 5, Health Units in the remainder of Southern Ontario (south of Muskoka-Parry Sound and Renfrew, and extending from Huron to Ottawa and Eastern Ontario) may begin submitting dead crows. From this date forward, all Health Units are to ship no more than 4 birds/week to CCWHC.

Beginning Tuesday May 20, the remaining Health Units in more northern parts of the province may begin shipping dead crows and ravens to CCWHC.

Mechanics of shipping: The same protocols for handling and shipping birds that were used in 2002 should be followed. Shipments should be made Purolator Collect, and pre-printed waybills and submission forms will be sent to each Health Unit by CCWHC before their start date.

Duration of Dead Bird Surveillance

The goal of dead bird surveillance is detection of WNV activity sufficiently early that appropriate measures can be taken by public health authorities to mitigate the risk of human infection. The support for testing is being provided largely by Health Canada, and the cost is such (~$20/test) that we do not have the resources for testing to evaluate at high geographic or temporal resolution the distribution of WNV infected birds in particular areas.

We will keep accepting birds, after the first WNV + is detected, from peripheral areas of the first few positive Health Units, especially if they are scattered around the province. But as evidence gathers from positive birds in more, and contiguous, Health Units, we may cut some later HUs off at one positive bird, and as the distribution becomes more clearly widespread, we will stop dead crow surveillance completely, at least in southern Ontario.

Testing and Reporting

Testing will be carried out at CCWHC Guelph, using an antigen wicking ELISA (VecTest®), applied to a swab collected from the oropharyngeal area of the bird. This test is ~85% sensitive and ~95% specific in our hands, in corvids only, in comparison with the TaqMan RTPCR on organs carried out last year. Use of VecTest® at Guelph gives the potential for 24 hour turnaround in testing, and obviates the second courier shipment to Winnipeg, often with an intervening weekend. The specimen can be obtained more simply, and the test takes about 30 minutes to carry out.

There is some cost in sensitivity, but we feel that this is compensated by the simpler and faster bird handling and sample collection in our lab, and more rapid test reporting. Most VecTest + birds will be subject to confirmatory testing by PCR on tissues. This will deal with the relatively small probability that a VecTest + result is false. All initial VecTest + birds in a Health Unit will be subject to confirmatory PCR testing, and subsequent birds may be, depending on test burden and cost.

All Vectest + results will be reported directly by CCWHC to the Health Unit involved, and concurrently to the Chief Medical Officer of Health for Ontario, and to Health Canada. We expect confirmatory PCR testing to be carried out at the University of Guelph Animal Health Laboratory, but if PCR is not on stream there at the time that the season begins, it will be done at the Health Canada Winnipeg Lab. Since the burden of front line PCR testing of all dead bird samples has been removed from the Winnipeg lab, their turnaround times shouldn't be excessive, if it is necessary to use them initially. Once PCR capability for diagnosis of WNV is established in Guelph, we expect the turnaround for confirmatory testing to be no more than 2-3 days.

Data on all birds submitted to CCWHC Ontario/Nunavut will be entered in the CCWHC database, and will be captured by Health Canada for national monitoring, WNV status maps and public information tables. As in the past, a short moratorium will be in place before such data becomes public, so that the local health authorities have an opportunity to implement their plans to deal with the eventuality that WNV activity would be detected.

Communications

The email address remains the same: ccwhc@ovc.uoguelph.ca

The extension for our telephone number has been modified by the introduction of a '5' in front of our old extension number, and now is: (519) 823 8800 Ext 54662.

The FAX number remains (519) 821 7520.

We will be emailing and phoning to confirm WNV surveillance and reporting contact names and numbers in individual Health Units over the first 2 weeks of April.

SUBMISSION OF DEAD BIRDS FOR WEST NILE VIRUS SURVEILLANCE
ONTARIO - 2003

The species to be submitted for West Nile diagnosis are **crows and ravens** only. **Sightings** of dead birds are to be collected at the discretion of each Health Unit, for local analysis, and **are not to be submitted to the Canadian Cooperative Wildlife Health Centre Guelph** for data entry in 2003. The protocols for handling and submission fo dead birds are summarized below. They have not changed from 2002.

The **schedule of surveillance, and the testing and reporting process have been modified**, as described in the document (attached) which was made available to Health Units at the Toronto consultation on March 20, and which was subsequently sent by email from CCWHC Guelph to each Health Unit.

RESPONSE TO A SICK OR DEAD BIRD

Health Units need to develop local plans for a timely response to reports of sick or dead birds. This response should incorporate 4 steps, described below. First contact with the person finding sick or dead birds normally will be by Health Unit personnel manning telephones. Those employees should be made aware of the organization of the program locally, and be informed about how to deal with calls about dead birds. A protocol needs to be in place for the collection and submission of carcasses to CCWHC. Pick-up and submission of birds may be by Health Unit personnel or by others contracted locally to carry out nuisance or dead animal response. **All persons taking decisions regarding response and submission, and those handling and submitting dead birds, must be familiar with this document.**

1. The person receiving a call records, on a CCWHC West Nile Virus Surveillance Form (appended): date of call, identity/contacts of caller, species involved (if known), condition of carcass(es), and exact location. Based on that information and criteria described below (species, carcass condition, number of birds sick or dead) decide whether the bird should/can/will be picked up, and if possible, inform caller of that decision. **This person will need to try to determine if the bird involved is a species of concern, specifically a crow or raven** (see Appendix re bird identification for questions to ask). If the bird can't/won't be picked up, inform caller of means of carcass disposal (see below).
2. Despatch, as soon as possible, person responsible for pick-up of bird, if appropriate based on decision in 1.
3. Collection of dead bird: the person doing so revises/completes the WNV Surveillance Form based on direct identification of species and local observations. A decision is made re suitability for submission, based on informed knowledge of species, condition/appearance of carcass and circumstances of mortality. If the bird is not suitable for submission, retrieve and dispose of appropriately.
4. Submit suitable carcass to CCWHC lab, as described below, accompanied by WNV Surveillance Form.

SPECIES OF PARTICULAR CONCERN:

Submit only carcasses of crows and ravens that are suitable for examination (see below), up to the weekly quota allotted (see March 20, 2003 document appended).

OTHER SPECIES OF BIRDS

CCWHC also carries out surveillance for diseases other than WNV in all species of wild birds. Birds of other species should be submitted to CCWHC for autopsy **if there is a clear history of central nervous system signs** (loss of fear, tremors, convulsions, paralysis, wing droop, immobile limb) in live birds, or **if there appears to be an outbreak of disease** (several birds of any species reported affected/dead in a local area [~2 km radius] within a period of 2-3 days). Also **submit any raptorial birds** reported (eagles, hawks, falcons, kestrels, owls etc.). **Use the WNV Surveillance Form to accompany the carcass to the CCWHC.**

If it is not feasible to collect and submit such birds, have the person reporting call the **CCWHC Communications Coordinator (519 823 8800 Ext 54662)** for instructions on how to submit a bird themselves.

A complete autopsy and full diagnostic workup is carried out on all birds other than those submitted for WNV surveillance. If WNV infection is suspected as the cause of death in such a case, it will be submitted for WNV

detection as well.

CONDITION OF CARCASS

Birds must be intact and reasonably fresh (not obviously rotten, no maggots or scavenging) for profitable examination. **Birds that have been found on roadsides or obviously have been traumatized are acceptable.** Crows with WNV seem more susceptible to trauma and misadventure than normal, perhaps because they are sick. Carcasses that are in the open, full sun etc., could be moved to the shade by the person finding the bird, if they are willing (see instructions for handling, below).

A complete examination for cause of death is not normally carried out on WNV surveillance submissions; tissues for WNV detection are all that is retrieved. As well, in the event of a WNV outbreak, effort will be focussed on determining the geographic distribution of infection. Hence, WNV status may not be determined on every carcass, depending on workload and recent WNV activity in the Health Unit. As WNV activity clearly becomes established in a Health Unit, or more widely, dead bird surveillance will be discontinued in parts of a Health Unit, or in individual or contiguous Health Units or larger regions of the province, depending on the extent of WNV activity that has been recognized. This decision will come from the CCWHC Ontario Communications Coordinator, by email or phone, and will be preceded by consultation with Health Unit WNV contact persons regarding reasonable and clear-cut boundaries to areas from which birds should not be submitted, if the entire Health Unit is not involved. This is to save the cost of collection, submission and processing of birds from known endemic areas, so that we can focus our resources on determining the extent of the outbreak beyond its known distribution.

If there is any uncertainty regarding whether-or-not a submission should be made, telephone the CCWHC Communications Coordinator for advice (519 823 8800 Ext. 54662).

HANDLING BIRDS:

Although direct transmission of WNV from birds to people is not known to occur other than through accidental needle sticks, lacerations etc., during laboratory handling, West Nile virus is present in excretions and secretions from affected birds, and members of the public are to be discouraged from handling dead birds. If they must do so for submission or disposal, they should follow these guidelines, which also should be followed by all others handling birds, including Health Unit or Animal Control personnel picking up birds for surveillance.

Live, sick birds should be referred to a local animal control agency, humane society, rehabilitator or collaborating veterinarian for evaluation and, if appropriate, euthanasia, preferably by a method that does not damage the brain. If they meet the species and other criteria, such birds, and those recently-dead of natural causes are ideal submissions.

Birds or carcasses should be handled using an implement such as a small shovel or large tongs, or by hand only if disposable plastic or rubber gloves are worn. Alternatively, carcasses may be placed in a puncture-resistant leak-proof plastic bag of appropriate size by everting the bag over the hand, then grasping the carcass through the bag, and wrapping the bag around the bird without touching it. Heavy-duty plastic bags of adequate size should be used to contain the bird, sealed securely by a twist-tie, knotted string, or by knotting the bag tightly on itself. It then should be placed inside a second leak-proof plastic bag, which is similarly sealed. Double-bagging prevents cross-contamination between carcasses and fluid leaks in shipping. Carcasses should be chilled, but not frozen, unless it will be impossible to get them to the lab within 24-36 hours (distance, weekend intervening), in which case they should be frozen. If in doubt about freezing specimens, consult the CCWHC Communications Coordinator for advice.

Carcasses not submitted should be double-bagged and placed in garbage destined for a landfill, or buried

several feet deep where they will not be disturbed. Do not dispose of in a manner such that they could be handled again by someone. **People handling birds should wash thoroughly with soap and water afterward**.

SUPPLIES REQUIRED FOR SUBMISSION OF A BIRD

Canadian Cooperative Wildlife Health Centre Ontario/Nunavut Region WNV Surveillance Forms: **copy from sample appended**; download from the Internet at http://wildlife.usask.ca; or contact CCWHC Communications Coordinator and request additional forms to be sent by fax or email attachment (see contact information below).

Zip-Loc or other clear plastic bags of a size appropriate to enclose WNV Surveillance Forms.

Heavy duty plastic bags big enough to enclose a crow or raven, and strong enough to resist puncture by bills, beaks and claws; secure ties for same.

Waterproof labels/tags, or small waterproof plastic bags (Zip-loc or Whirl-pac) in which to enclose labels/tags; waterproof marking instrument.

Frozen cold packs (**not wet ice**).

Newspaper and a larger leak-proof plastic bag (such as a garbage bag) in which to wrap specimens.

Insulated shipping containers: hard-sided plastic picnic cooler with return address clearly marked. Do not use styrofoam, cardboard or other non-durable shipping containers.

Heavy packing/shipping/duct tape.

SUBMISSION OF SPECIMENS:

If more than one specimen is being submitted, they should be double bagged separately. Bagged carcasses should be identified clearly, using a waterproof writing instrument, on a waterproof label or tag affixed to the carcass, or on paper sealed inside a leak-proof plastic bag, and enclosed inside the bag containing the carcass. **Each Health Unit must develop a coding system for identifying birds submitted from their region, and put the reference number on the carcass tag and on the WNV Surveillance Form in the space provided.** This number will be carried over with other information on the bird to our database, and will assist you in identifying results reported.

A separate WNV Surveillance Form should be filled out legibly for each carcass to accompany the shipment. The form, or forms, if more than one carcass is being submitted, should be enclosed in a Zip-Loc bag (it is permissible to fold the form) and placed in a sealed 8.5 x 11" envelope securely taped on the outside to the side or top of the shipping container.

The 2003 WNV Surveillance Form should include the following information; spaces to fill in, or responses to circle, prompt a response to each item on the form:

- Name of the person completing the submission form, full mailing address, telephone number, Fax number, email address
- Address to send report, if different from above
- Date bird reported to Health Unit
- Internal reference number used by the Health Unit
- Name of the person reporting dead bird(s), full mailing address, telephone number
- Location bird found (most specific street or rural municipal address [Twp., Concession, Lot #], including municipality, province or territory and postal code). In rural areas, due to implementation of a new automated mapping database, 911 addresses are of little use, and Twp/concession/lot are of limited value, though each is better than no address. **If possible, for rural locations, in addition to other address descriptors, include GIS coordinates** (latitude, longitude **as decimal WGS84 data to 4 decimal places or more, not minutes and seconds**). Otherwise, describe a rural address in relation to a clear locality (e.g. 6 km NW of Aberfoyle). A specific location, if possible, is very important, to facilitate mapping of each submission for epidemiologic purposes.
- Species: circle species name (crow, raven), or 'unknown', or enter written name of 'other' species. Species of birds submitted will be confirmed by CCWHC, but try to be as accurate as possible.
- Date carcass picked up
- Date submitted

Entries related to sightings can be ignored

Double-bagged carcasses should be wrapped in several layers of newspaper, which insulates them and absorbs fluid. A freezer pack (not wet ice) should be wrapped in the newspaper with the chilled carcass(es), but is unnecessary with frozen carcasses. The carcass(es) in newspaper then should be placed in an outer plastic bag, such as a heavy-duty garbage bag, which is sealed securely. The wrapped, bagged carcass then should be placed in a hard-sided plastic insulated picnic cooler (which will be disinfected, rinsed out and sent back with a new waybill enclosed, if it has a return address). **All shipping containers must be securely packed, sufficiently sturdy, and taped shut, to prevent leaks, breakage or opening in handling. Leakage or breakage of a single package in transit could place the entire shipping system, and therefore the surveillance program, in jeopardy.**

Packages should be shipped to the address on the pre-addressed and coded waybills provided by CCWHC. Waybills left over from the 2001 season can be used, but new supplies of waybills will be sent in 2002, and a new waybill will be enclosed in shipping containers returned to you. The waybills provided have been completed fully, with the exception of the information regarding the sender, and the weight. **Please fill in the weight of the parcel on all waybills.** The weight must be marked on the waybill for us to get the concessional rate on shipping charges. Parcels should be under 10 pounds gross weight, if possible. **There is no need to fill in the value of the shipment;** if you do, use 'Nil', or a value under $100. **Do not check any options regarding delivery times in the Service Box;** these options can cost us hundreds of dollars per shipment. The contents of the parcel have been described correctly as a 'DIAGNOSTIC SPECIMEN - WILDLIFE' on the preprinted waybills sent to you. **Do not use any other terms, and do NOT check the Dangerous Goods square.** The packaging and labelling described matches the criteria for courier transport of carcasses to diagnostic laboratories during WNV investigations in the USA.

Ship by Purolator Courier to:
Canadian Cooperative Wildlife Health Centre,
University of Guelph,
OVC Receiving, Building 49,
Guelph, ON N1G 2W1.
[If you need additional waybills, call 519 823 8800 Ext. 54662, or email at ccwhc@ovc.uoguelph.ca].

Ship on Mondays to Thursdays inclusive, ground delivery. **Do not ship specimens on Friday**. Freeze specimens that cannot be shipped to arrive overnight Monday-Friday, and ship on the next appropriate day, bearing in mind any long weekends. **Phone, FAX or Email the CCWHC lab with the waybill # of each shipment**, the day that it is shipped [see phone #, email address above]. This helps us track any shipments that go astray.

Be sure to enclose all WNV Surveillance Forms in a clearly marked envelope taped securely to the outside of the shipping container. **Do not enclose WNV Report Forms in bags with carcasses.**

Dead Bird Surveillance for West Nile Virus
Ontario - 2003
Ian K. Barker - 03.03.20

Strategy

The goal is to detect crows and ravens dead of West Nile Virus as early as possible, in light of the probability that, at least in the very southern tier of Health Units in Ontario, where WNV was active in 2001 and 2002, the virus has overwintered in mosquitoes. This may permit early initiation of the amplification cycle in the warmer parts of Ontario. The probability of a mosquito carrying WNV later in the summer/fall is a function of time and temperature over the amplification cycle (higher temperatures shorten mosquito life cycles, and shorten the time taken for mosquitoes infected with WNV to become infectious for other birds or mammals). Hence, the earlier the amplification cycle is initiated, the higher the risk of transmission to people and mammals later in the season.

The initial stages in the process will not change from last year: public education to detect and report dead crows to the health unit; and the health unit shipping birds by courier collect to the Canadian Cooperative Wildlife Health Centre Ontario/Nunavut in Guelph. Modifications in the detection and reporting of WNV infected crows have been made to shorten the test turnaround time, and are described below. And sightings of dead birds will not be entered in the CCWHC database, since, in Canada, the utility of such data in surveillance as a surrogate for dead bird testing, or as a means of quantifying regional risk of infection, has yet to be substantiated.

Time of Initiation of Dead Bird Surveillance

Beginning Tuesday April 15, CCWHC will receive dead crows from the southern tier of Health Units (Windsor-Essex, Chatham-Kent, Lambton, Elgin-St. Thomas, Middlesex-London, Oxford, Brant, Haldimand-Norfolk, Niagara, Hamilton, Halton, Peel, Toronto, York, and Durham). These Health Units each can submit up to 6 dead crows/week, up until Thursday May 1.

Beginning Monday May 5, Health Units in the remainder of Southern Ontario (south of Muskoka-Parry Sound and Renfrew, and extending from Huron to Ottawa and Eastern Ontario) may begin submitting dead crows. From this date forward, all Health Units are to ship no more than 4 birds/week to CCWHC.

Beginning Tuesday May 20, the remaining Health Units in more northern parts of the province may begin shipping dead crows and ravens to CCWHC.

Mechanics of shipping: The same protocols for handling and shipping birds that were used in 2002 should be followed. Shipments should be made Purolator Collect, and pre-printed waybills and submission forms will be sent to each Health Unit by CCWHC before their start date.

Duration of Dead Bird Surveillance

The goal of dead bird surveillance is detection of WNV activity sufficiently early that appropriate measures can be taken by public health authorities to mitigate the risk of human infection. The support for testing is being provided largely by Health Canada, and the cost is such (~$20/test) that we do not have the resources for testing to evaluate at high geographic or temporal resolution the distribution of WNV infected birds in particular areas.

We will keep accepting birds, after the first WNV + is detected, from peripheral areas of the first few positive Health Units, especially if they are scattered around the province. But as evidence gathers from positive birds in more, and contiguous, Health Units, we may cut some later HUs off at one positive bird, and as the distribution becomes more clearly widespread, we will stop dead crow surveillance completely, at least in southern Ontario.

Testing and Reporting

Testing will be carried out at CCWHC Guelph, using an antigen wicking ELISA (VecTest®), applied to a swab collected from the oropharyngeal area of the bird. This test is ~85% sensitive and ~95% specific in our hands, in corvids only, in comparison with the TaqMan RTPCR on organs carried out last year. Use of VecTest® at Guelph gives the potential for 24 hour turnaround in testing, and obviates the second courier shipment to Winnipeg, often with an intervening weekend. The specimen can be obtained more simply, and the test takes about 30 minutes to carry out.

There is some cost in sensitivity, but we feel that this is compensated by the simpler and faster bird handling and sample collection in our lab, and more rapid test reporting. Most VecTest + birds will be subject to confirmatory testing by PCR on tissues. This will deal with the relatively small probability that a VecTest + result is false. All initial VecTest + birds in a Health Unit will be subject to confirmatory PCR testing, and subsequent birds may be, depending on test burden and cost.

All Vectest + results will be reported directly by CCWHC to the Health Unit involved, and concurrently to the Chief Medical Officer of Health for Ontario, and to Health Canada. We expect confirmatory PCR testing to be carried out at the University of Guelph Animal Health Laboratory, but if PCR is not on stream there at the time that the season begins, it will be done at the Health Canada Winnipeg Lab. Since the burden of front line PCR testing of all dead bird samples has been removed from the Winnipeg lab, their turnaround times shouldn't be excessive, if it is necessary to use them initially. Once PCR capability for diagnosis of WNV is established in Guelph, we expect the turnaround for confirmatory testing to be no more than 2-3 days.

Data on all birds submitted to CCWHC Ontario/Nunavut will be entered in the CCWHC database, and will be captured by Health Canada for national monitoring, WNV status maps and public information tables. As in the past, a short moratorium will be in place before such data becomes public, so that the local health authorities have an opportunity to implement their plans to deal with the eventuality that WNV activity would be detected.

Communications

The email address remains the same: ccwhc@ovc.uoguelph.ca

The extension for our telephone number has been modified by the introduction of a '5' in front of our old extension number, and now is: (519) 823 8800 Ext 54662.

The FAX number remains (519) 821 7520.

We will be emailing and phoning to confirm WNV surveillance and reporting contact names and numbers in individual Health Units over the first 2 weeks of April.

ONTARIO/NUNAVUT REGION
CANADIAN COOPERATIVE WILDLIFE HEALTH CENTRE
Department of Pathobiology, Ontario Veterinary College
University of Guelph, Guelph, Ontario N1G 2W1
Telephone: [519] 823-8800 Ext. 54662 / FAX: [519] 821-7520
email: ccwhc@ovc.uoguelph.ca

WEST NILE VIRUS SURVEILLANCE FORM - 2003

(for use in West Nile Virus Surveillance only)
(Use a CCWHC Incident Report Form to report other wildlife disease/mortality incidents)

Date received by CCWHC: Necropsy #: CCWHC #:

Name of person filling out this form:	Address for report:
Address Postal Code Email address: Phone # [ ] FAX # [ ]	 Postal Code Email address: Phone # [ ] FAX # [ ]

Date reported to Health Unit (Yr/Mo/Day) Health Unit Reference #:

Found by (name, mailing address, telephone):

Location where dead bird found: (Full urban street address; Rural Twp., Lot, Concession; Postal Code or GIS coordinates if possible)

Postal Code: _____

GIS/GPS: Latitude _____._____deg N; Longitude: _____._____deg W (use decimal WGS84 setting & 4 or more decimal places)

Species: (circle - separate form for each bird, please) Age: Juv Ad Unkn Sex: M F Unkn
Crow (CCWHC use only)
Raven
Unknown Other (write in) _____

Carcass considered worth picking up based on description (circle) Yes OR No, not picked up (Sighting only - FAX to CCWHC)
(circle/date when done)

Date carcass visited: (Yr/Mo/Day) picked up (circle) OR Not picked up (Sighting only - FAX to CCWHC)
(circle/date when done)

Date Carcass Submitted to CCWHC: (Yr/Mo/Day) OR (circle) Not sent (Sighting only - FAX to CCWHC)
(circle/date when done)

Carcass: (circle) Fresh Frozen

Spontaneous death? (circle) Yes No (how killed?) _____

Appendix II

Permit Applicant Guide: Controlling Mosquito Larvae for Prevention and/or Control of West Nile Virus (Ministry of the Environment)

Attached is the document forwarded to Health Units on or about April 7 by the Ministry of the Environment.

Submitted April 10, 2003

Appendix III

Mosquitoes of Southern Ontario

Host Preferences

Genus and Species (WNV carriers in bold[1])	Host Preferences
Anopheles	
barberi	
earlei	
punctipennis	
quadrimaculatus	man, larger mammals, sometimes birds and rarely reptiles
walkeri	
Culex	
pipiens	birds primarily (rarely mammals, reptiles)
restuans	birds primarily (rarely mammals, reptiles)
tarsalis	birds and mammals
territans	amphibians primarily (rarely birds, reptiles)
salinarius	birds and mammals
Culiseta	
culiseta	birds primarily but also mammals and man
impatiens	
inornata	birds primarily but also large mammals
melanura	
minnesotae	
morsitans	birds
Coquillettidia (Mansonia)	
perturbans	birds and large mammals
Psorophora	
ciliata	
columbiae (confinnis)	
ferox	
Uranotaenia	
sapphirina	may not blood-feed
Wyeomyia	
smithii	may not blood-feed

[1] Detected in Ontario mosquitoes in 2001 and/or 2002; there are additional species on the list that have tested positive in the US or in other Canadian provinces, but have not yet tested positive in Ontario

Appendix 3: ***Mosquitoes of Southern Ontario*** **Host Preferences (continued)**

Genus and Species	Host Preferences
Orthopodomyia	may not blood-feed
alba	
signifera	
Toxorhynchites	
rutilis septentrionalis	nectar, larvae predacious on other larvae
Aedes	all species - mostly mammals
albopictus	
cinereus	
vexans	
vexans nipponi	
Ochlerotatus (formerly in ***Aedes***)	all species - mostly mammals but also birds
abserratus	
atropalpus	
aurifer	
barri	
campestris	
canadensis	above plus reptiles and amphibians
cantator	
communis	
decticus	
diantaeus	
dorsalis	
euedes	
excrucians	
fitchii	
flavescens	
grossbecki	
hendersoni	
implicatus	
intrudens	
japonicus	
provocans	
punctor	
rempeli	
riparius	
sollicitans	
sticticus	
stimulans	
thibaulti	
trichurus	
triseriatus	
trivittatus	

Appendix 3 (continued): ***Mosquitoes of Southern Ontario***

Breeding Site Preferences

Genus and Species (WNV carriers in bold)	**Life Cycle** (explanation of numbers follows this table) and **Breeding Site Preferences**
Anopheles	- all in permanent or semi permanent water
barberi	
earlei	
punctipennis	
quadrimaculatus	
walkeri	12
Culex	
pipiens (dusk-dawn biter)	9 (polluted water in containers/permanent or semi-permanent water)
restuans (dusk-dawn biter)	9 (containers/permanent or semi-permanent water/ditches)
tarsalis	
territans	9 (exposed water)
salinarius (dusk-dawn)	8
Culiseta	
culiseta	(shaded water/permanent or semi-permanent water/ditches)
impatiens	9 (permanent or semi-permanent water/ditches/containers)
inornata	10
melanura	2
minnesotae	2 (exposed water)
morsitans	
Coquillettidia (Mansonia) perturbans	larvae attached to roots and stems of emergent vegetation (found in bogs, ponds and lakes)
Psorophora	- road side ditches
ciliata	4
columbiae (confinnis)	4
ferox (day and night biter)	4
Uranotaenia	
sapphirina	
Wyeomyia	
smithii	13 (Pitcher plant leaves)
Orthopodomyia	
alba	13 (container)
signifera	13 (container)
Toxorhynchites	
rutilis septentrionalis	13

Aedes	
albopictus	6
cinereus	3 (temp. forest & semi-shaded meadow/permanent or semi-permanent water/exposed open pools)
vexans (dusk to dawn)	4 (flood water/permanent or semi-permanent/temp. forest & semi-shaded meadow/exposed open pools/ditches)
Ochlerotatus (formerly in ***Aedes***)	
abserratus	2 (temporary forest pools/permanent or semi-permanent water/exposed open pools/ditches)
atropalpus	1 (rock pools)
aurifer	2
barri	
campestris	
canadensis	3 (shaded water/rock pools)
cantator	5
communis	1 (temp. forest pools/exposed open pools)
decticus	2
diantaeus	1
dorsalis	4
excrucians	1 (temp. forest & semi-shaded meadow pools/permanent or semi-permanent water/exposed open pools/ditches)
fitchii	2 (temp. forest & semi-shaded meadow pools/permanent or semi-permanent water/exposed open pools)
flavescens	4
hendersoni	6
implicatus	1 (temp. forest & semi-shaded meadow pools/permanent or semi-permanent water/ditches)
intrudens	1 (temp. forest & semi-shaded meadow pools/permanent or semi-permanent water)
provocans	1
punctor	1 (temp. forest & semi-shaded meadow pools/exposed open pools/rock pools)
rempeli	1
riparius	4
sticticus	3 (flood water/permanent or semi-permanent water/temp. forest pools/ditches)
stimulans	1 (temp. forest pools/permanent or semi-permanent water)
thibaulti	6 (tree holes/artificial containers)
trichurus	4 (temp. forest pools/permanent or semi-permanent water/exposed open pools)
triseriatus (day biter)	14
trivittatus	1 (temp. forest & semi-shaded meadow/permanent or semi-permanent water/exposed open pools)
japonicus (day biter)	6 (tree holes/artificial containers - tires)

Explanation of Life Cycle Numbers

Life Cycle 1
- $ Desiccation resistant eggs laid in ground depressions
- $ Larvae develop in woodland snow pools high in leaf tannin (brown water)
- $ Single generation in early spring
- $ Overwinters in the egg stage

Life Cycle 2
- $ Desiccation resistant eggs laid above waterline in saturated soil habitats
- $ Larvae develop in swamps and bogs
- $ Single generation in early spring
- $ Overwinters in the egg stage

Life Cycle 3
- $ Desiccation resistant eggs laid in ground depressions
- $ Larvae develop in a wide range of transient freshwater habitats
- $ Major generation in early spring followed by sporadic egg hatch later in the season
- $ Overwinters in the egg stage

Life Cycle 4
- $ Desiccation resistant eggs laid in ground depressions
- $ Larvae develop in a wide range of transient freshwater habitats (floodwaters)
- $ Multiple generations each year
- $ Overwinters in the egg stage

Life Cycle 5
- $ Desiccation resistant eggs laid on a substrate that will be flooded by lunar tides
- $ Larvae develop in salt marsh pools
- $ Multiple generations each year
- $ Overwinters in the egg stage

Life Cycle 6
- $ Desiccation resistant eggs laid above the waterline in a container habitat (e.g. tree hole)
- $ Larvae develop in a wide range of natural and artificial containers
- $ Multiple generations each year depending on rainfall
- $ Overwinters in the egg stage

Life Cycle 7
- $ Non-desiccation resistant eggs laid directly on water
- $ Larvae develop in freshwater swamp habitats (clean water with emergent plants)
- $ Multiple generations each year
- $ Overwinters as a mated female

Life Cycle 8
- $ Non-desiccation resistant eggs laid directly on water
- $ Larvae develop in permanent brackish water habitats
- $ Multiple generations each year
- $ Overwinters as a mated female

Life Cycle 9
- $ Non-desiccation resistant eggs laid directly on water
- $ Larvae develop in polluted water habitats (usually urban)
- $ Multiple generations each year
- $ Overwinters as a mated female

Life Cycle 10
- $ Non-desiccation resistant eggs laid directly on water
- $ Larvae develop in freshwater swamp habitats
- $ Multiple generations each year
- $ Overwinters in the larval stage

Life Cycle 11
- $ Non-desiccation resistant eggs laid directly on water
- $ Larvae develop in fresh water swamp habitats (larva and pupa breathe through underwater penetration of plant stems)
- $ Single generation each year
- $ Overwinters in the larval stage

Life Cycle 12
- $ Non-desiccation resistant eggs laid directly on water
- $ Larvae develop in fresh water swamp habitats
- $ Multiple generations each year
- $ Overwinters in the egg stage and develops into a larvae in late winter/early spring

Life Cycle 13
- $ Non-desiccation resistant eggs laid directly on water in container habitats (e.g. Pitcher plants/ treeholes)
- $ Larvae develop in natural or artificial containers
- $ Multiple generations each year
- $ Overwinters in the larval stage

Life Cycle 14
- $ Breeds in subterranean crypts, in dark recesses of upturned trees, under the base of hollowed out trees
- $ Single generation
- $ Overwinters as eggs if larval habitat is dry in fall or in the 2nd/3rd larval stage

Appendix IV

National Guidelines for Response

(National Steering Committee for West Nile Virus)

This Appendix previously contained the January 3, 2003 draft from Health Canada. Some key information or guidelines in those national guidelines have since been updated or superseded by regulation or guidelines in Ontario. For example, the national guidelines for actions based on the national "Risk Categories" have been superseded in Ontario by O. Reg. 199/03 (please see Appendix 7).

In addition, a more up-to-date Case Definition for Human WNv Infection is contained in the present Ontario "Preparedness Plan" document. Other information in the appendices of the national guidelines may remain useful as a technical resource for Medical Officers of Health and Health Units. This Appendix is being held for a future version of the National Guidelines for Response, when available from Health Canada and the National Steering Committee.

March 27, 2003

Appendix V

Halton Regional Health Unit - Example of WNV Data Management - 2002

The following is a presentation in PowerPoint format made to Halton Regional Council on March 5, 2003 reporting upon the West Nile virus activity in Halton Region for 2002.

It is the Ministry's opinion that this represents an excellent presentation of the data available to the Medical Officer of Health using global positioning system technology.

Presented with kind permission.

WNV Surveillance Data in Halton 2002

Presentation to Regional Council
March 5th, 2003

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WNV Surveillance Data in Halton 2002

Birds

- >5000 dead bird sightings
- >2700 crows
- 14 Positive Dead Birds *(of 38 collected)*

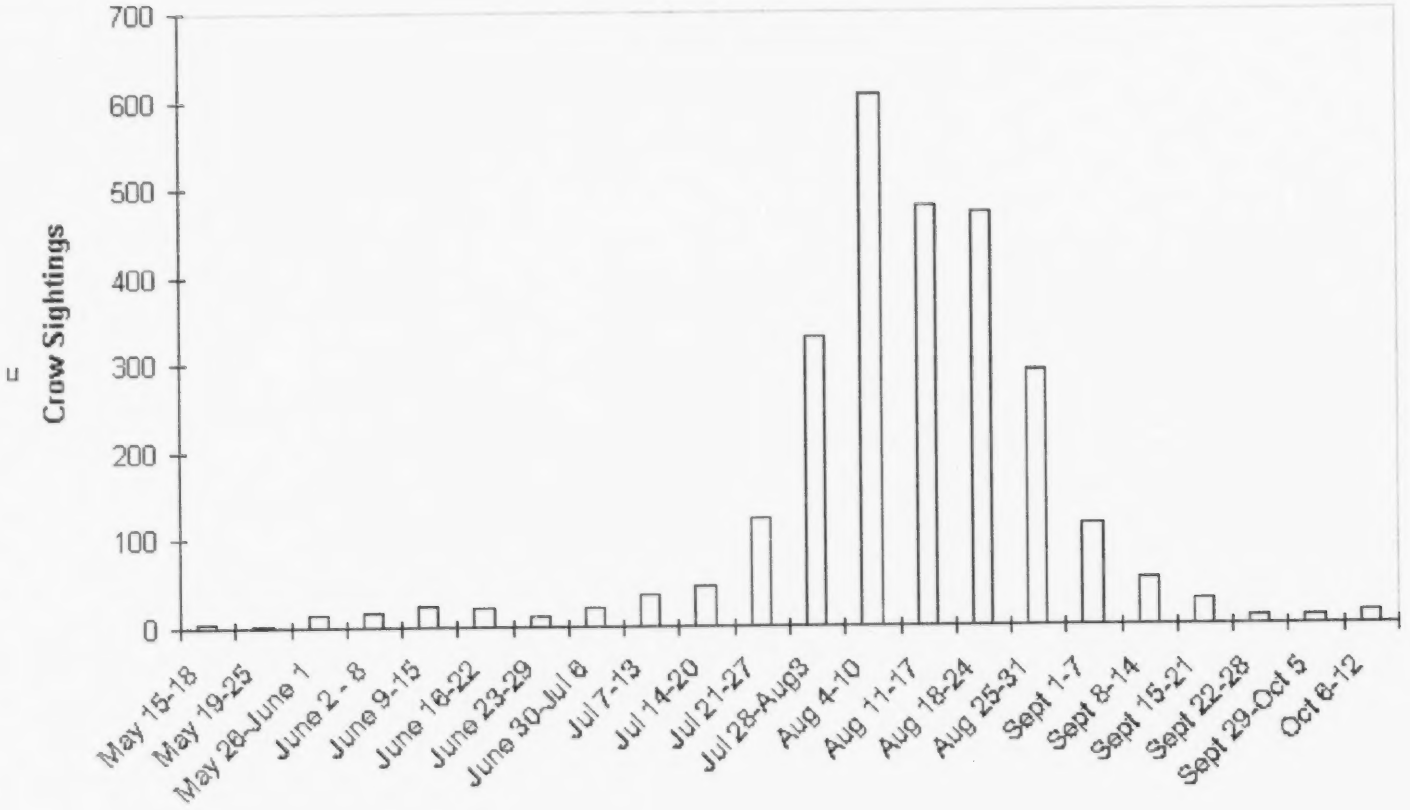
Mosquitoes

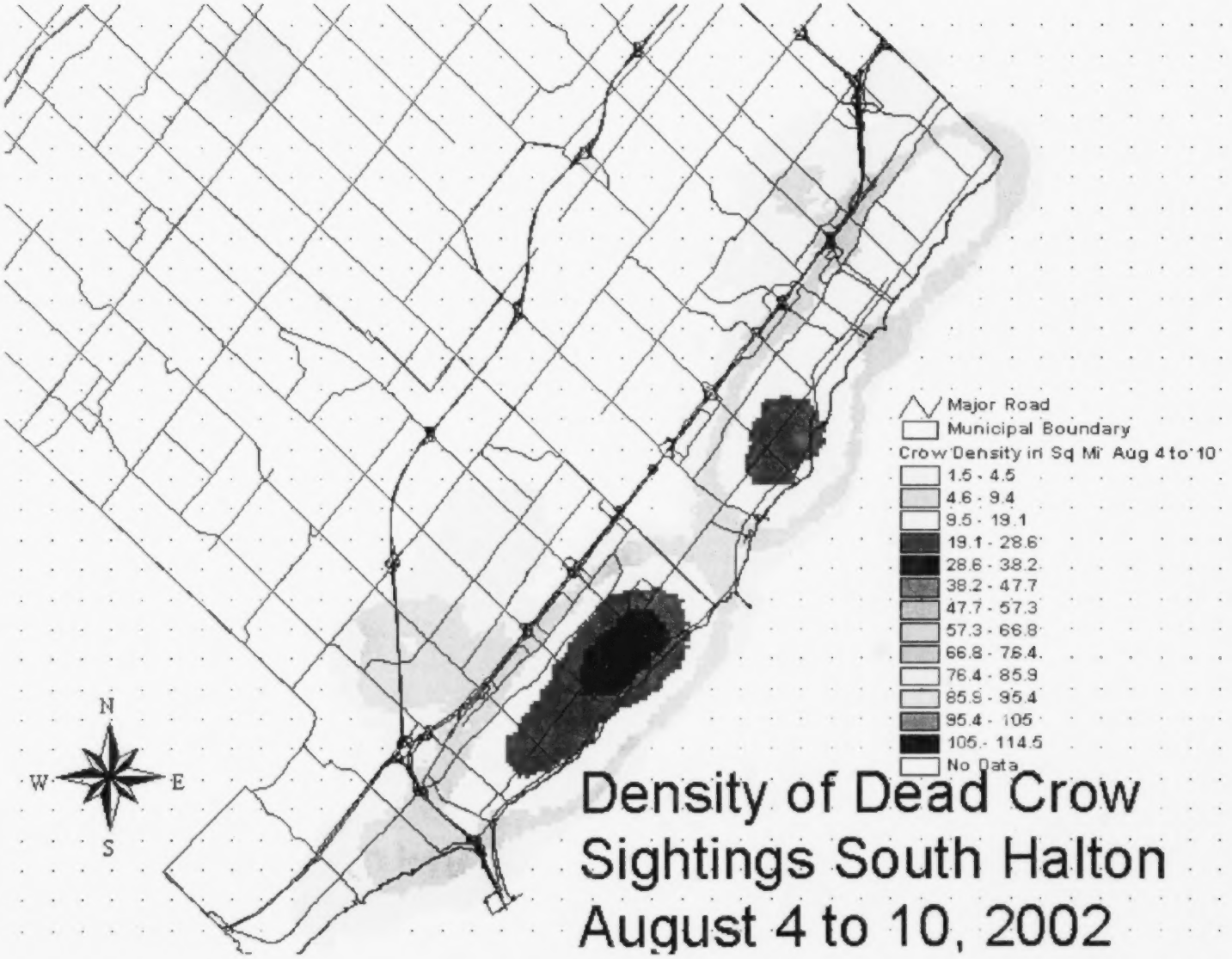
- 24 positive pools at 6 sites *(183 pools collected)*

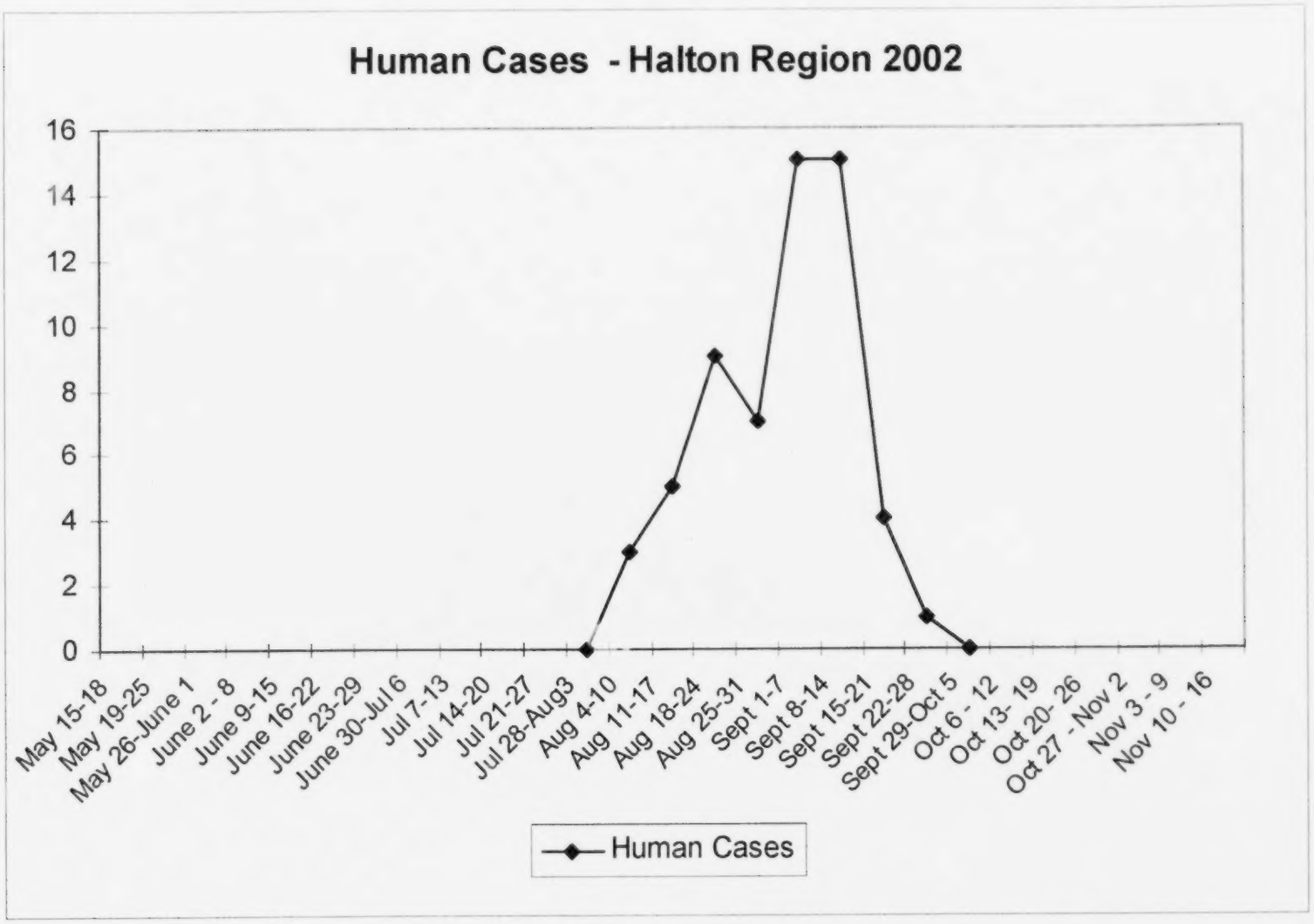
Humans *(as of February 19, 2003)*

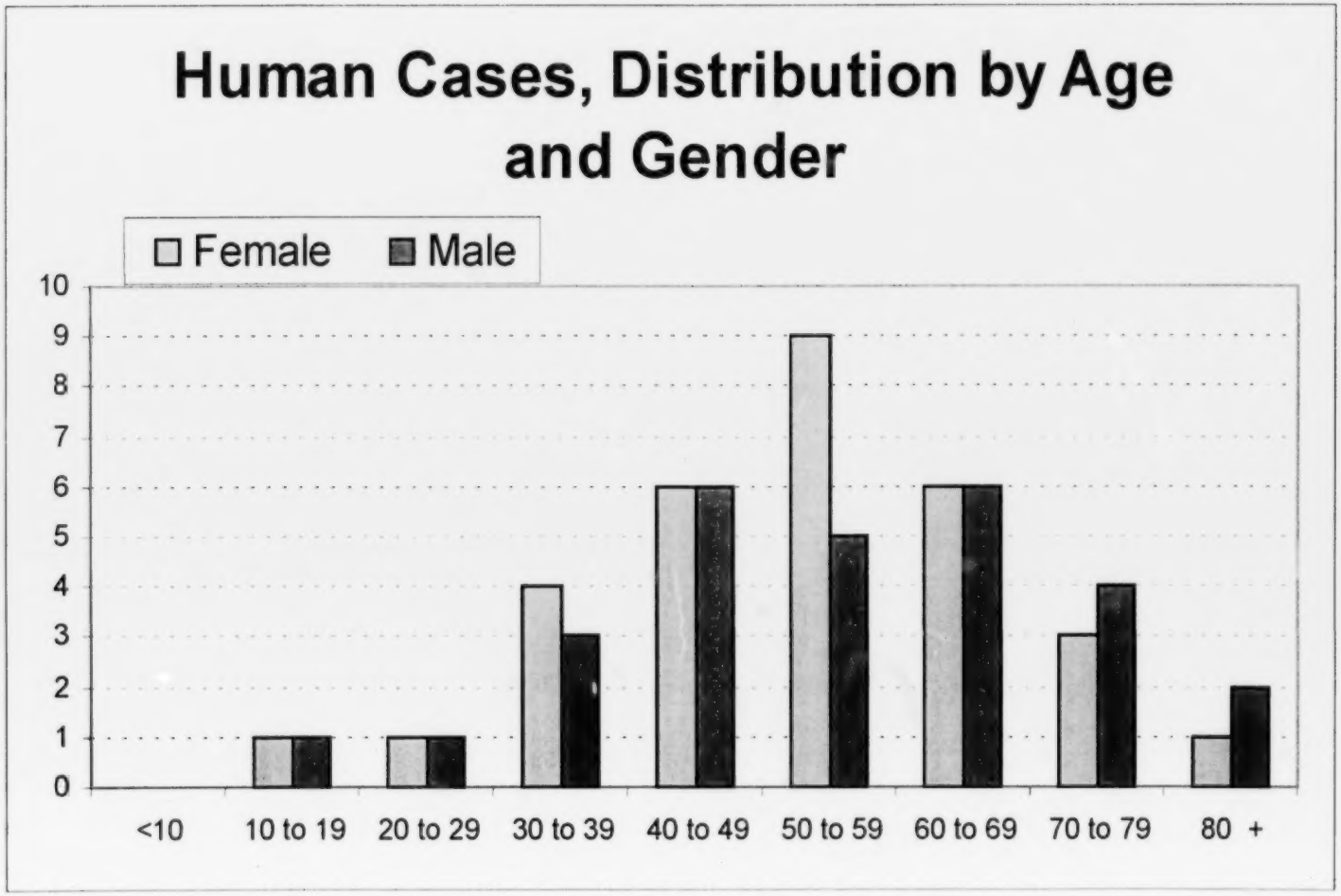
- Confirmed 42
- Probable 17
- Suspect 27

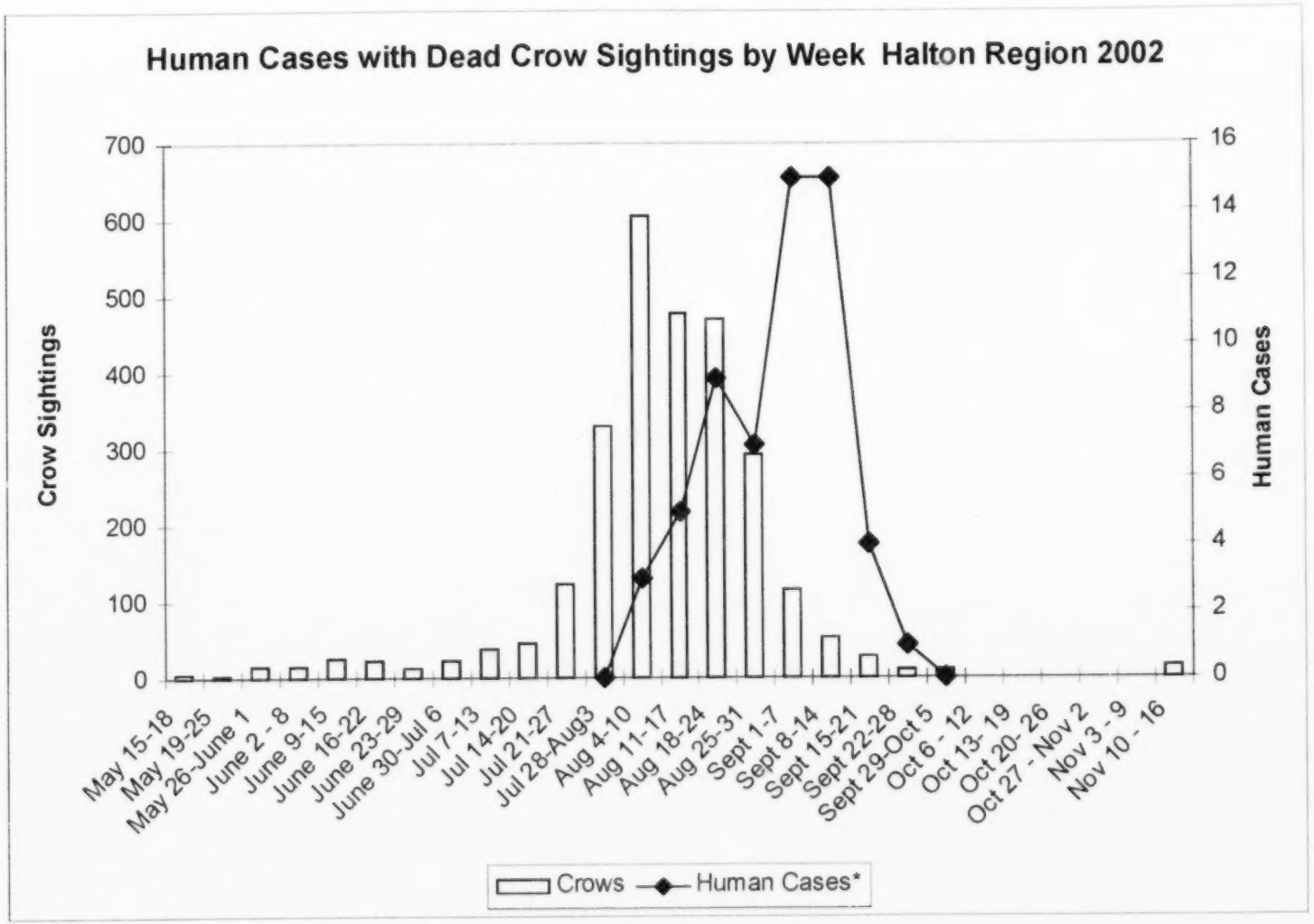
Dead Crow Sightings by Week
Halton Region 2002

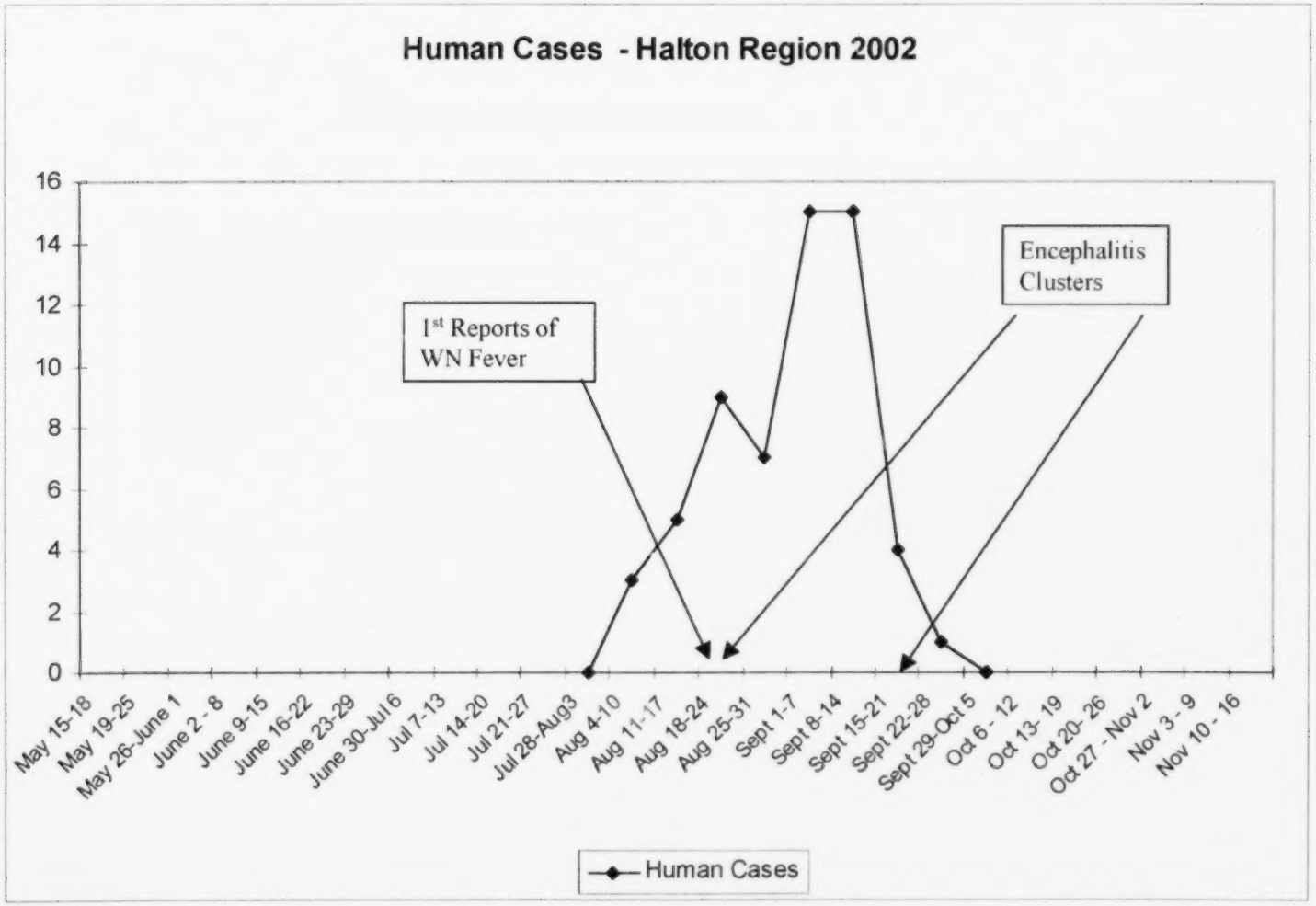


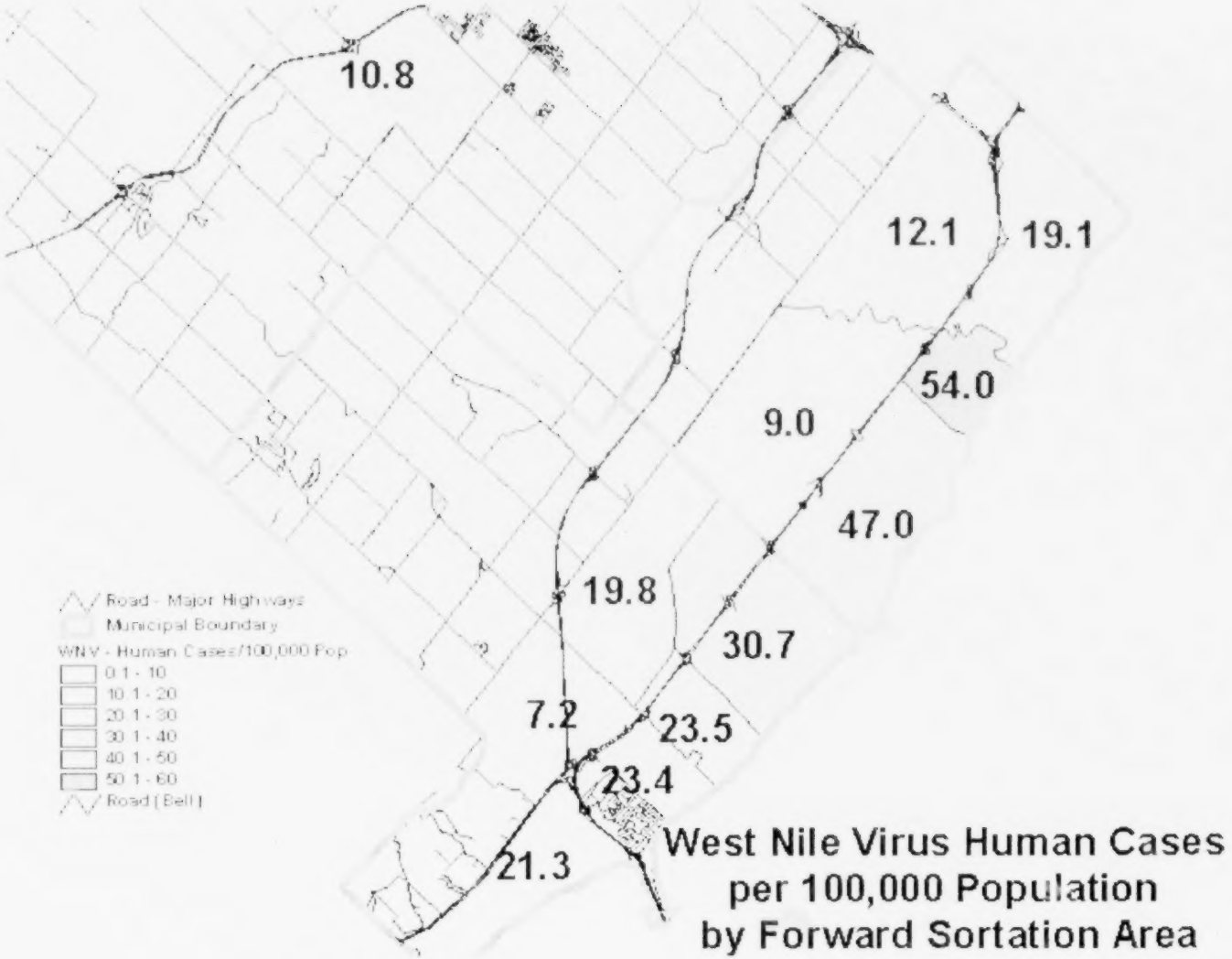

Major Road
Municipal Boundary
Crow Density in Sq Mi Aug 4 to 10
1.5 - 4.5
4.6 - 9.4
9.5 - 19.1
19.1 - 28.6
28.6 - 38.2
38.2 - 47.7
47.7 - 57.3
57.3 - 66.8
66.8 - 76.4
76.4 - 85.9
85.9 - 95.4
95.4 - 105
105 - 114.5
No Data
N
W
E
S
Density of Dead Crow Sightings South Halton August 4 to 10, 2002

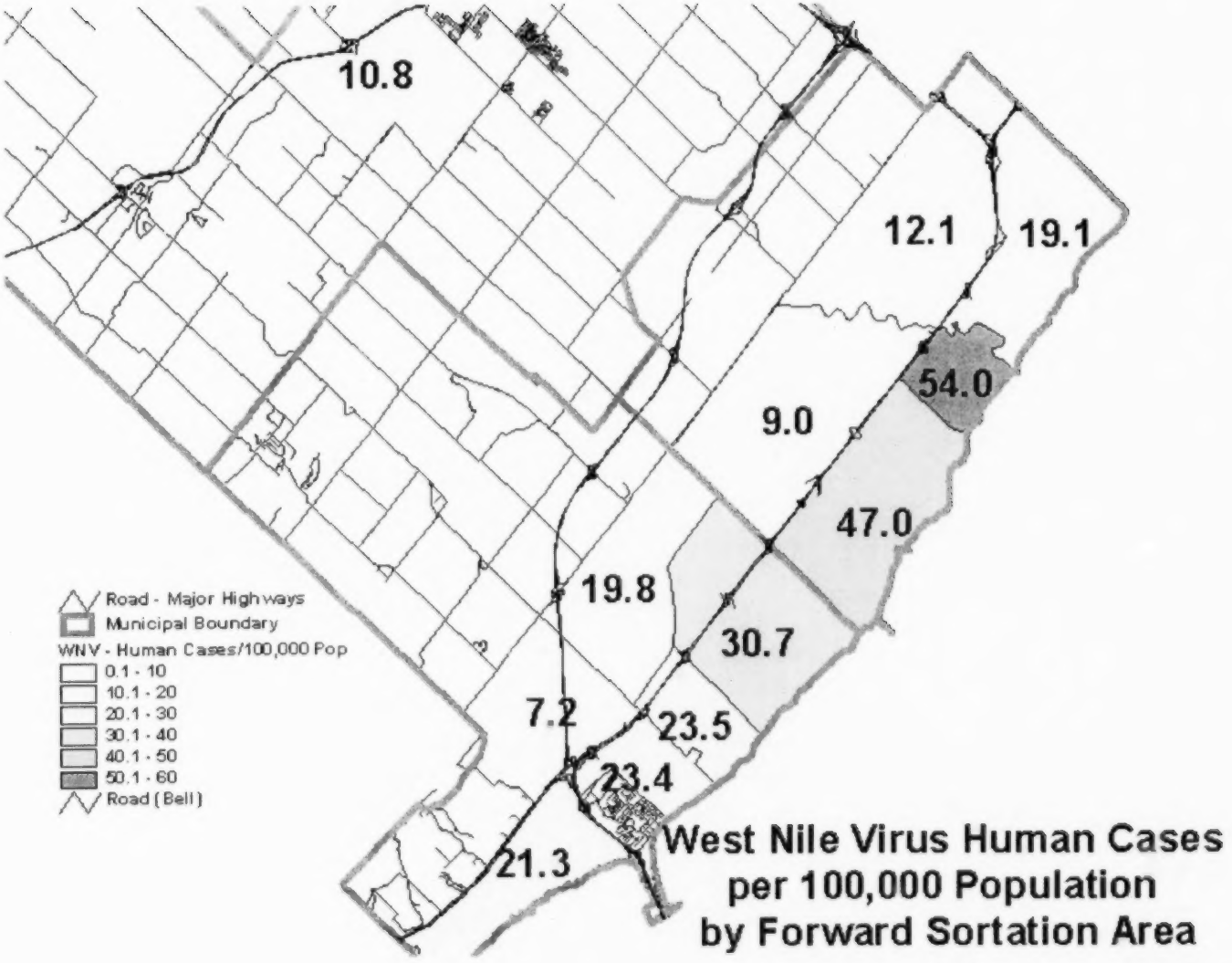

Human Cases - Halton Region 2002
16
14
12
10
8
6
4
2
0
May 15-18
May 19-25
May 26-June 1
June 2 - 8
June 9-15
June 16-22
June 23-29
June 30-Jul 6
Jul 7-13
Jul 14-20
Jul 21-27
Jul 28-Aug3
Aug 4-10
Aug 11-17
Aug 18-24
Aug 25-31
Sept 1-7
Sept 8-14
Sept 15-21
Sept 22-28
Sept 29-Oct 5
Oct 6 - 12
Oct 13- 19
Oct 20- 26
Oct 27 - Nov 2
Nov 3 - 9
Nov 10 - 16
Human Cases


Human Cases, Distribution by Age and Gender
Female
Male
10
9
8
7
6
5
4
3
2
1
0
<10
10 to 19
20 to 29
30 to 39
40 to 49
50 to 59
60 to 69
70 to 79
80 +


Human Cases with Dead Crow Sightings by Week Halton Region 2002
Crow Sightings
Human Cases
700
600
500
400
300
200
100
0
16
14
12
10
8
6
4
2
0
May 15-18
May 19-25
May 26-June 1
June 2 - 8
June 9-15
June 16-22
June 23-29
June 30-Jul 6
Jul 7-13
Jul 14-20
Jul 21-27
Jul 28-Aug3
Aug 4-10
Aug 11-17
Aug 18-24
Aug 25-31
Sept 1-7
Sept 8-14
Sept 15-21
Sept 22-28
Sept 29-Oct 5
Oct 6 - 12
Oct 13- 19
Oct 20- 26
Oct 27 - Nov 2
Nov 3 - 9
Nov 10 - 16
Crows
Human Cases*


Human Cases - Halton Region 2002
16
14
12
10
8
6
4
2
0
1st Reports of WN Fever
Encephalitis Clusters
May 15-18
May 19-25
May 26-June 1
June 2 - 8
June 9-15
June 16-22
June 23-29
June 30-Jul 6
Jul 7-13
Jul 14-20
Jul 21-27
Jul 28-Aug 3
Aug 4-10
Aug 11-17
Aug 18-24
Aug 25-31
Sept 1-7
Sept 8-14
Sept 15-21
Sept 22-28
Sept 29-Oct 5
Oct 6 - 12
Oct 13- 19
Oct 20- 26
Oct 27 - Nov 2
Nov 3 - 9
Nov 10 - 16
Human Cases


10.8
12.1
19.1
54.0
9.0
47.0
19.8
30.7
7.2
23.5
23.4
21.3
Road - Major Highways
Municipal Boundary
WNV - Human Cases/100,000 Pop
0.1 - 10
10.1 - 20
20.1 - 30
30.1 - 40
40.1 - 50
50.1 - 60
Road (Bell)
West Nile Virus Human Cases
per 100,000 Population
by Forward Sortation Area


10.8
12.1
19.1
54.0
9.0
47.0
19.8
30.7
7.2
23.5
23.4
21.3
Road - Major Highways
Municipal Boundary
WNV - Human Cases/100,000 Pop
0.1 - 10
10.1 - 20
20.1 - 30
30.1 - 40
40.1 - 50
50.1 - 60
Road (Bell)
West Nile Virus Human Cases
per 100,000 Population
by Forward Sortation Area

Halton West Nile Virus Cases

Presentation

	Number of Cases Presenting	% of Total	Number Hospitalized	% Hospitalized of Cases Presenting
Encephalitis	32	54.2%	15	46.9%
Meningitis	12	20.3%	4	33.3%
West Nile Fever	15	25.4%	0	0
Total	59	100%	19	32.2%

Age Presentation

	Age in years			Median Age of Those Hospitalized
	Youngest	Oldest	Median	
All Cases	11	86	52	61
Encephalitis	35	86	53	71*
Meningitis	22	68	48.5	47.5
West Nile Fever	11	80	46	N/A

* All 8 cases of encephalitis in those 70 years of age and over were hospitalized

West Nile Virus Control Program

- Monitoring and Surveillance
- Public Education
  - Habitat elimination
  - Personal protection
- Mosquito Control
  - Habitat elimination
  - Larvicide

For more information call
Halton Region Health Department at
905-825-6060
Toll free: 1-866-4HALTON (1-866-442-5866)
TTY 905-827-9833

www.region.halton.on.ca/health

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Appendix VI

Surveillance for West Nile virus (WNv) Illness

Ontario's WNv case definition is based on Health Canada's case definition. At the time of writing, Health Canada's case definition had not been completed. Ontario's case definition will be updated in order to be consistent with the Health Canada case definition upon completion. Both Ontario's and Health Canada's case definitions were drafted with available information at the time of writing. Case definitions and diagnostic test criteria are subject to change as new information becomes available.

For surveillance purposes, WNv Illness will consist of WNv Neurological Manifestations (WNNM), WNv Fever (WNF), and WNv Asymptomatic Infection (WNAI). WNNM and WNF will each consist of the categories "Suspect", "Possible", "Probable", and "Confirmed", and WNAI will consist of the categories "Probable" and "Confirmed", respectively, depending on laboratory diagnostic test results.

The case definitions have two criteria for each of WNNM, WNF, and WNAI. One criterion is based on clinical features of the illness and the other criterion is based on laboratory test results.

A. Case Definitions:

1) West Nile virus Neurological Manifestations (WNNM):

Clinical Criteria:

History of exposure in an area where WNv activity is occurring [a]
OR
history of exposure to an alternate mode of transmission [b]
AND
onset of fever
AND AT LEAST ONE associated neurological manifestation consistent with a diagnosis of

- encephalitis or meningoencephalitis, or
- viral meningitis, or
- acute flaccid paralysis (poliomyelitis-like syndrome or Guillain-Barré-like syndrome). [c]

Note: A significant feature of WNv encephalitis may be marked muscle weakness, therefore WNv should be considered in the differential diagnosis of all suspected cases of acute flaccid paralysis that is more frequently unilateral, but could be bilateral, with or without sensory deficit. Emerging clinical syndromes, identified during 2002, included: movement disorders (e.g., tremor, myoclonus); parkinsonism (e.g., cogwheel rigidity, bradykinesia, postural instability); rhabdomyolysis (acute destruction of skeletal muscle cells). Other clinical syndromes that were identified during 2002 included, but were not limited to the following: peripheral neuropathy; polyradiculopathy; optic neuritis; and acute demyelinating encephalomyelitis (ADEM).

[a] **Note:** History of exposure when and where WNv transmission is present, or could be present, or history of travel to an area with confirmed WNv activity in birds, horses, other mammals, sentinel chickens, mosquitoes, or humans.
[b] **Note:** Alternate modes of transmission identified to date include: laboratory-acquired; *in utero*; receipt of blood components; organ/tissue transplant; and, possibly via breast milk.

[c] **Note:** A person with WNv-associated acute flaccid paralysis may present with or without fever or mental status changes (altered mental status could range from confusion to coma with or without additional signs of brain dysfunction (e.g. paresis or paralysis, cranial nerve palsies, sensory deficits, abnormal reflexes, generalized convulsions and abnormal movements)).

Suspect WNNM Case:

Clinical criteria IN THE ABSENCE OF OR PENDING any diagnostic test criteria (see B. West Nile Virus Diagnostic Criteria) AND IN THE ABSENCE of any other obvious cause.

Possible WNNM Case:

Clinical criteria AND AT LEAST ONE of the possible case diagnostic test criteria (see B.1).

Probable WNNM Case:

Clinical criteria AND AT LEAST ONE of the probable case diagnostic test criteria (see B.2).

Confirmed WNNM Case:

Clinical criteria AND AT LEAST ONE of the confirmed case diagnostic test criteria (see B.3).

2) West Nile virus Fever (WNF):

Clinical Criteria:

History of exposure in an area where WNv activity is occurring [a]
OR
history of exposure to an alternate mode of transmission [b]
AND
onset of fever
AND AT LEAST ONE of the following: [d]

- myalgia, or
- arthralgia, or
- headache, or
- fatigue, or
- photophobia, or
- lymphadenopathy, or
- maculopapular rash

[d] **Note:** It is possible that other clinical symptoms could be identified that have not been listed and may accompany probable case or confirmed case diagnostic test criteria.

Suspect WNF Case:

Clinical criteria IN THE ABSENCE OF OR PENDING any diagnostic test criteria (see B. West Nile Virus Diagnostic Criteria) AND IN THE ABSENCE of any other obvious cause.

Possible WNF Case:

Clinical criteria AND AT LEAST ONE of the possible case diagnostic test criteria (see B.1).

Probable WNF Case:

Clinical criteria AND AT LEAST ONE of the probable case diagnostic test criteria (see B.2)

Confirmed WNF Case:

Clinical criteria AND AT LEAST ONE of the confirmed case diagnostic test criteria (see B.3)

3) West Nile virus Asymptomatic Infection (WNAI): [e]

Probable WNAI Case:

Probable case diagnostic test criteria (see B.2) IN THE ABSENCE of clinical criteria

Confirmed WNAI Case:

Confirmed case diagnostic test criteria (see B.3) IN THE ABSENCE of clinical criteria

[e] **Note:** This category could include asymptomatic blood donors whose blood is screened using a Nucleic Acid Amplification Test (NAT), by Blood Operators (i.e. Canadian Blood Services or Hema-Quebec) and is subsequently brought to the attention of public health officials. The NAT assay that will be used by Blood Operators in Canada is designed to detect all viruses in the Japanese encephalitis (JE) serocomplex. The JE serocomplex includes WNv and 9 other viruses, although from this group only WNv and St Louis encephalitis virus are currently endemic to parts of North America. Further testing, outlined in part B, will be necessary to identify the specific virus from a blood donor with a reported positive donor screening test.

B. West Nile virus Diagnostic Test Criteria:

B.1 Possible Case Diagnostic Test Criteria:

AT LEAST ONE of the following:

B.1.1 - A single serum sample which is indeterminate (i.e., a positive to negative (P to N) ratio greater than 2 and less than 3) for WNv IgM by IgM capture ELISA,
or
B.1.2 - A single titre greater than or equal to 1:10 and less than 1:320 on haemagglutination inhibition (HI), or a stable HI titre in acute and convalescent sera.

Note: The use of the possible case category is at the discretion of the Province/Territory or other jurisdiction. The possible case category could include the following: laboratory diagnoses that most likely represent WNv infection from a previous season; OR, persons with static titres on acute and convalescent sera; OR, persons from whom only a single serum sample is available and cannot be resolved using either WNv IgM ELISA or flavivirus haemagglutination

inhibition (HI).

B.2 Probable Case Diagnostic Test Criteria:

Early in the WNV season each year, the first five cases in a health unit jurisdiction who have positive assays noted below in B.2.1, B.2.2, B.2.3, B.2.4 and/or B.2.5 will require confirmation by Plaque Reduction Neutralization Test (PRNT). After the first five cases have been confirmed, positive assays noted in B.2.1, B.2.2, B.2.3, B.2.4 and/or B.2.5 will be considered a confirmed case.

AT LEAST ONE of the following:

B.2.1 - A single serum sample which is positive (i.e., with positive to negative (P to N) ratio greater than or equal to 3) for WNv IgM by IgM capture ELISA, [f]
[note that IgM ELISA will be the principal screening test for the 2003 season]
or
B.2.2 - A single elevated titre greater than or equal to 1:320 by haemagglutination inhibition (HI) in serum ,
or
B.2.3 - A four-fold or greater change in HI or enzyme-linked immunosorbent assay (ELISA) IgG titres in paired acute and convalescent sera,
or
B.2.4 - Demonstration of IgM antibody to WNv in CSF by IgM-capture ELISA,
or
B.2.5 - Demonstration of Japanese encephalitis (JE) serocomplex-specific genomic sequences in blood by NAT screening tests on donor blood, by Blood Operators in Canada.

Note: Immunocompromised individuals may not be able to or may be slow to mount an immune response necessary for a serological diagnosis. WNv diagnostic test criteria for these individuals should be discussed with a medical microbiologist.

B.3 Confirmed Case Diagnostic Test Criteria:

Early in the WNv season each year, the first five positive cases in a health unit jurisdiction who have positive assays noted below in B.3.1, B.3.2, B.3.3, and B.3.4 will require confirmation by B.3.5 (i.e., PRNT). After the first five are confirmed, positive assays noted in B.3.1, B.3.2, B.3.3, and B.3.4 (or B.2.1, B.2.2, B.2.3, B.2.4 and/or B.2.5) will be considered a confirmed case. Subsequently, a "to be determined" number of assays noted in B.3.1, B.3.2, B.3.3, and B.3.4 (or B.2.1, B.2.2, B.2.3, and/or B.2.4) will be routinely confirmed by B.3.5 (i.e., PRNT) throughout the WNV season in order to rule-out the possibility of concurrent activity by other flaviviruses.

AT LEAST ONE of the following:

B.3.1 - A single serum sample which is positive (i.e., with positive to negative (P to N) ratio greater than or equal to 3) for WNv IgM by IgM capture ELISA [f],
[note that IgM ELISA will be the principal screening test for the 2003 season]
or
B.3.2 - A single elevated titre greater than or equal to 1:320 by haemagglutination inhibition

(HI) in serum,
or
B.3.3 - A four-fold or greater change in HI or enzyme-linked immunosorbent assay (ELISA) IgG titres in paired acute and convalescent sera,
or
B.3.4 - Demonstration of IgM antibody to WNV in CSF by IgM-capture ELISA,

AND

B.3.5 – Confirmation of assays noted in B.3.1, B.3.2, B.3.3, and B.3.4 by Plaque Reduction Neutralization Test (PRNT)

OR

B.3.6 - Isolation of WNv from, or demonstration of WN virus antigen or WN virus-specific genomic sequences in tissue, blood, CSF or other body fluids

Note: Immunocompromised individuals may not be able to or may be slow to mount an immune response necessary for a serological diagnosis. West Nile virus diagnostic test criteria for these individuals should be discussed with a medical microbiologist.

[f] **Note:** Longitudinal studies of encephalitis cases due to WNv have shown that WN virus-specific IgM antibody may persist in serum for 12 months or longer in a small number of patients. Thus, the presence of serum anti-WN viral IgM antibody in an asymptomatic individual is not necessarily diagnostic of *acute* WN viral infection.

APPENDIX VII

ONTARIO REGULATION 199/03

made under the

HEALTH PROTECTION AND PROMOTION ACT

Made: May 14, 2003
Filed: May 15, 2003
Printed in *The Ontario Gazette:* May 31, 2003

CONTROL OF WEST NILE VIRUS

Determination if action required

1. A medical officer of health shall make a determination, based upon a local risk assessment in accordance with the document published by the Ministry of Health and Long-Term Care entitled *West Nile Virus Preparedness and Prevention Plan for Ontario*, whether action is required by a municipality to decrease the risk of West Nile Virus to persons either inside or outside the health unit served by the medical officer of health.

Notice to municipality

2. (1) Where the medical officer of health has determined that action is required, he or she may give notice to the municipality of the required action.

(2) In determining required actions under subsection (1), the medical officer of health shall have regard to,

(a) the document mentioned in section 1; and

(b) the generally accepted practices in the field of public health with regard to decreasing the risk of West Nile virus to persons.

Must comply

3. A municipality shall comply with any requirements set out in the notice.

What may be required

4. Action required under this Regulation may include, without being limited to,

(a) requirements respecting source reduction measures;

(b) requirements respecting surveillance;

(c) requirements respecting public awareness campaigns about personal protection;

(d) requirements respecting the control measures for larviciding and adulticiding set out in Table 1; and

(e) requirements respecting the time within which the action shall be taken.

TABLE 1

LARVICIDING AND ADULTICIDING IN ONTARIO

WEST NILE VIRUS RESPONSE

"Triggers" based on surveillance of WNv positive humans, birds, mosquito pools or mammals (horses)

Current-Year WNv findings in Health Unit or municipality	Last Year's WNv findings in Health Unit or municipality	Preparatory Status (Larval surveys, mosquito trapping, mapping, training, etc.)	Larviciding ACTION	Adulticiding ACTION
No West Nile virus found yet	No West Nile virus found; virus found in adjacent Health Unit(s)	Not yet done	Do the preparatory work, then larvicide where indicated	Not indicated
No virus found yet	Virus found	Not yet done	Do the preparatory work,	Not indicated

			then larvicide where indicated	
No virus found yet	Virus found	Done last year and under way this year	Larvicide where indicated	Not indicated
Virus found in non-human (dead bird, mosquito pool or mammal) – isolated or as a "hot spot"	Virus found or not found	Done or under way this year	If a "hot spot" and larvae are present, larvicide around this "hot spot" (if not too late in the season)	Adulticide a 3-km "Zone" ONLY IF there are high-risk indicators of transmission to humans*
Human case(s) - one or a few in a space-time "cluster"	Virus found or not found	Done or under way this year	Larvicide around the case or cluster if larvae are present (and if not too late in season)	Adulticide a 3-km radius Zone around the case or cluster
Human cases continue to occur; continued high-risk indicators*	Virus found or not found	Done or under way this year	Larvicide widely where larvae are found (if not too late in season)	Adulticide 3-km Zones – may be contiguous or overlapping

Note: Public education efforts and non-pesticide means of mosquito source reduction should be in place, and increased as increasing evidence of virus is found (especially human cases) in the current year.

* High-risk indicators of transmission to humans: increasing dead bird sightings; high mosquito infection rates; abundant bridge vector populations; increasing mammal (horse) cases; proximity of mosquito breeding sites to human populations (especially large population centres) and weather conditions that favour mosquito breeding.

1. These are minimum activity standards. Medical Officers of Health may increase the Zone size to be treated or take additional mosquito control actions, if justified by scientific data or recommendations.
2. Medical Officer of Health will maintain a means to record, investigate, and report any confirmed or likely adverse or unintended human health effects attributed to mosquito control actions, and will report any non-human environmental adverse effects that he or she knows about to the Ministry of the Environment and/or other relevant local or provincial authorities.

Addendum to Appendix 7 (O. Reg. 199/03)

Implementation Aspects related to Ontario Regulation 199/03

2003 West Nile virus Season

The West Nile virus is a relatively new disease agent, with only four years of known occurrence in the Western Hemisphere, and two years in Ontario and Canada. With each passing year, the body of knowledge about the virus – and about the measures needed for surveillance, prevention and control – continues to accumulate in North America.

The *West Nile Virus Preparedness and Prevention Plan for Ontario*, and the attendant risk assessments made by local Medical Officers of Health (*Section 1* of the Regulation), seek to reflect this evolving body of scientific knowledge. Moreover, the evolving epidemiology of the virus requires enhancements or adjustments in the capacity of the public health system to engage in, or facilitate, the necessary surveillance, prevention and control measures. These two general factors – "the state of the science" and "the state of capacity" – guide the "generally-accepted practices in the field of public health" (*Section 2* of the Regulation).

The risk assessments for West Nile virus are predicated on the understanding that the general goal of public health intervention is to reduce the risk to human health - zero risk is unachievable - at a population level and interventions therefore are aimed at populated areas.

Section 4 of the Regulation states those actions that "may" be included in the notices given by the Medical Officers of Health to municipalities. The numerous and sometimes unique local factors to be considered in making the risk assessments preclude the institution of an *a priori*, centrally-mandated, fixed set of responses for each local jurisdiction. Whatever decisions are taken, however, they should be recorded, with the accompanying rationale.

With regard to *Subsection 4 (d)* and the accompanying "Table 1" ("*Larviciding and Adulticiding in Ontario*"), the following elaborations or clarifications apply:

(1) When a health unit or municipality "moves" to a different "status" of West Nile virus findings in the current year (*far-left column of Table 1*), the recommended action does not preclude actions taken or started during the prior status. For example, when "non-human" evidence of the virus is found, and larviciding around a "hot spot" is indicated, this action would be *in addition to* any prior larviciding that was indicated *before* evidence of the virus was found.

(2) A "*hot spot*" is defined as a collection of two or more local positive findings in dead birds, mosquito pools or mammals (or a combination thereof) which indicate either epizootic transmission or persistent enzootic transmission – as distinct from "*isolated*" findings in such non-human hosts or vectors. The indication for larviciding is thus for the "hot spot", not an isolated finding. The other prerequisites for larviciding include establishment of the presence of the larvae and their breeding sites, the appropriate timing and seasonality, and the overall assessment of West Nile virus risk to the local population.

(3) The main goal of larviciding is the reduction of the local enzootic vector population in their identified breeding sites (e.g., catch basins, other container structures, etc.)

(4) With regard to adulticiding, the 3 kilometre (km) radius "zone" size is <u>not</u> a "hard and fast" rule. The actual physical extent of adulticide application is pre-eminently governed by the need to reduce the risk from epizootic or bridging vector populations near the local human population, while minimizing any unintended application (e.g., through drift) to non-target areas, species or populations.

Footnote #1 states that "*Medical Officers of Health may increase the Zone size to be treated . . .*" They *may* also *decrease* the zone size if an application of 3 km radius is not necessary to protect the local human population. For example, the "target area" may be on the outskirts of a town, where there are no persons residing beyond the town boundary for several kilometres. Or there may be an adjacent industrial area with no evidence of flying mosquitoes or breeding sites. Or if a 3-km zone would overlap an adjacent area that is already being, or has recently been, treated with adulticide.

(5) In the asterisked (*) footnote, the stated "*high-risk indicators of transmission to humans*" may be present <u>before</u> there is confirmation of a human case locally; this would mean that these are indicators of an *increased risk* of transmission to humans. <u>More than one</u> of these high-risk indicators should be evident before the decision is made to adulticide, in the *absence* of a human case.

(6) "Human case" means <u>confirmed</u> human case, according to the "Case Definition for Ontario", as stated in the main body of this document.

(7) Table 1 indicates that an adulticiding action *may* correspond to the finding of <u>one</u> human case (or "a few in a space-time cluster"). The operative word is "*may*" – refer to the wording of Section 4 (". . . *may include, without being limited to*"). Thus it is possible that adulticiding may *not* be ordered after the detection of every human case, for reasons of timing, prior treatment decisions, and the overall assessment of the risks versus benefits of that action.